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The
Geographical Journal.

No. 2. FEBRUARY, 1907. Vol. XXIX.

THE SNOWS OF THE NILE.*

Being an Account of the Exploration of the Peaks, Passes, and Glaciers of Ruwenzori.

By H.R.H. the DUKE OF THE ABRUZZI.

[H.R.H. the Duke of the Abruzzi gave the account which follows of his remarkably successful expedition to Mount Ruwenzori, illustrated by about one hundred magnificent lantern slides, at a special meeting of the Society in the Queen's Hall, Langham Place, on January 12, 1907. The Hall was filled to its utmost extent by a brilliant and distinguished audience, and the meeting was honoured by the presence of His Majesty the King, the Patron of the Society, and by H.R.H. the Prince of Wales, Vice-Patron. During the forty years that as Prince of Wales the King was Vice-Patron of the Society, he frequently attended its meetings, but this is the first occasion on which a reigning British monarch has thus honoured the Society. His Majesty's remarks on H.R.H. the Duke of the Abruzzi and on the lecture will be found at the end of the paper.]

* Map, p. 248. After the Duke's address, it became clear that our Society should take the initiative in attaching his name to some part of the range. He had called five of the six massifs after celebrated explorers who had first seen or visited Ruwenzori. He had named the sixth Mount Thomson, for which we have substituted Mount Luigi di Savoia. Joseph Thomson never saw Ruwenzori, and his famous name should be given to some region connected with his exploits. I have felt the less hesitation in initiating this change, as I have so often acknowledged my great debt to Thomson for his Sokoto journey in 1885, which laid the basis of British rights in a considerable part of Nigeria. —President R.G.S.

I am here, on the kind invitation of the Royal Geographical Society, to describe my recent exploration of the snowy summits, known as Ruwenzori, situated in the heart of Equatorial Africa and between two of the great lakes of the Nile sources, the Albert and Albert Edward. This range was probably seen, for the first time by Europeans, by Sir S. Baker in 1864, and later by Gessi in 1876. The English explorer gave the name of Blue Mountains to the distant heights he saw south of Lake Albert; and Gessi, in some of his private letters, described a strange apparition in the sky resembling snow-covered summits. But neither traveller formed any exact idea of the importance of the range, and to Sir Henry Stanley, therefore, was reserved the distinction of being its true discoverer. Stanley not only saw the mountain to the south from Lake Albert in 1888, but in the following year traversed its western slopes, and one of his companions, Lieut. Stairs, climbed to a height of 10,677 feet on its north-western spurs.

Stanley received many different answers to his inquiries as to the name locally given to these white mountains. Among the various native designations, he chose that of Ruwenzori, which, in the language of Mtsora, means "Rainmaker." A more appropriate one could hardly be found, since, on account of the clouds which continually envelop its flanks, the summits remain invisible for months and months, and even during the brief interval which separates the wet and dry seasons are only seen in the early morning hours. In the dry season they are obscured by haze from the observer on the plains.

Stanley identified the range with Ptolemy's Mountains of the Moon. But on this matter there exists among geographers much diversity of opinion. Some have sought the Mountains of the Moon in Kenya and Kilimanjaro, others in the summits that crown the highlands of Abyssinia; others, again, in the Mfumbiro volcanoes, situated in a district said to be known to the natives as the Country of the Moon, south of Lake Albert Edward and near the sources of the Kagera, an affluent of Lake Victoria and the most remote source of the Eastern Nile.

The Italian geographer, Dr. Hugues, has, at my request, kindly occupied himself with this interesting question. Basing his opinion on the latitudes and longitudes assigned by the Alexandrian geographer to his Nile lakes, which he holds to prove conclusively that these are identical with Lakes Victoria, Albert, and Albert Edward, he inclines to accept Stanley's view. At any rate, Ruwenzori is the only snowy range in the Nile basin, and therefore the only mountain that meets Ptolemy's statement that the Nile is fed from mountain snows.

Stanley's successors in the Ruwenzori region were Dr. Stuhlmann in 1891 and Scott Elliot in 1895. Stuhlmann ascended the valley of Butagu, on the west of the chain, to a height of 13,326 feet, and obtained a remarkable photograph of its glacier-clad peaks. Scott Elliot

made five excursions towards the central ridge, approaching it on the east by the valleys of Yeria, Wimi, Mobuku, and Nyamwamba, and on the west by the Butagu valley. In the last he reached 13,000 feet; in his earlier excursions he twice reached, from the Yeria and Wimi valleys, the watershed, but at lower elevations. Though neither traveller gained the snows, each made considerable collections and scientific observations. Dr. Stuhlmann was the first to recognize four distinct groups, to which he gave, in the order in which they presented themselves to him from north to south, the names of Kræpelin, Moebius or Kanyangungwe, Semper or Ngemwimbi, and Weismann, declaring that the second, Kanyangungwe, was the loftiest.

In 1900, Moore was the first to touch the snows on the Semper or Ngemwimbi, and to gain the height of 14,900 feet on the ridge to the east of this summit, which he erroneously believed to be part of the watershed. In the same year, Sir H. Johnston reached a similar height on the east slopes of the same mountain, which he renamed Kiyanja. To another peak, visible from the lower valley of the Mobuku, Johnston gave the name Duwoni, without, however, being able to ascertain whether it was one of those seen by Stuhlmann.

Since 1900 several attempts have been made on both sides of the mountain. On the east the Mobuku valley was always selected, and no one succeeded in attaining a greater height than Moore. On the west side, Dr. David believed himself to have reached a height of 16,728 feet on the glaciers of Mount Moebius. But as he also admits that he appeared to himself to be some 1400 feet below the highest peaks, his altitude is obviously erroneous. The partial ascents mentioned so far were made by explorers who were not mountaineers. In the winter of 1905 and the early spring of this year, however, two attempts were made by alpine climbers. The former of these parties, consisting of Mr. Douglas Freshfield, Mr. Mumm, and the Zermatt guide, Moritz Inderbinnen, reached in November a height of 14,500 feet on the glacier at the head of the Mobuku valley. Their plans were frustrated by the persistent fogs and rainstorms of the rainy season. They had been misled as to its date by the reports of Sir H. Johnston and others, who had failed to recognize the complete want of correspondence between the rains of Lake Victoria and those on Ruwenzori.

The second party, composed of an Austrian climber, Herr Grauer, and the missionaries Messrs. Maddox and Tegart, reached the lowest point in the ridge already attained by Moore, at a height they estimated at 15,000 feet. Grauer, like Moore, thought he had reached the watershed. This was all that had been recorded up to February, 1906, when I set about to complete my preparations, and settled my departure from Italy.

I knew that a party, sent out by the authorities of the British Museum for the purpose of making natural history collections, had been

on the slopes of Ruwenzori since December, and that one of its members was Dr. Wollaston, a member of the Alpine Club. But no news of any ascents having reached me up to the end of February, I held myself justified in feeling almost perfect confidence that, owing to the rains, which last through March, April, and May, Dr. Wollaston would not be able to make any attempts previous to my arrival, and I had grounds for hoping that I might at least be in time to be able to join him in ascents of the highest peaks.

By comparing the information furnished in the published narratives of my predecessor, or by word of mouth from the latest writers, such as Freshfield and David, I was led to the conclusion that the chain of Ruwenzori consists of four considerable mountain blocks running from north-east to south-west. Whether they were separated by deep valleys or connected by snowy ridges remained uncertain. One of these mountains, Semper or Ngemwimbi according to Stuhlmann and Moore, Kiyanja according to Johnston, Freshfield, and Grauer, was easily accessible from the Mobuku valley. The highest peak, perhaps identical with the Moebius of Stuhlmann, might be accessible from the ridge reached by Grauer.

The one point on which all explorers agreed, although they had attempted the mountain at different seasons, was the abominable weather encountered in the higher region: rain almost perpetual; mists in the brief intervals between the downpours; rare clearances, and those only about dawn. From notices furnished by missionaries in Toro and reported by Freshfield, and from the accounts of Sir William Garstin, I learnt that the least unfavourable months for mountaineering attempts were June and July, and also January and February, when, although the atmosphere, particularly in the lowlands, is obscured by haze, the rainfall is far less persistent, though it does not completely cease.

My expedition, therefore, had to take place in June and July. Considering our uncertainty as to the features of the mountain, and even its height, which had been variously estimated between 20,000 and 17,000 feet, and also the bad weather and clouds which must inevitably impede our progress above the snow-level, it seemed expedient to provide ourselves, as we had already done on my Mount St. Elias expedition, with the material necessary for camping and living on the ice. It followed that we must also take with us from Europe porters for the transport of this material at high elevations, since the natives of the eastern slope, the Bakonjo, though excellent carriers below the snow-level, become useless as soon as ice is touched. In provisioning my party I counted on a stay of forty days in the upper region, believing that this ought to be enough to conquer all obstacles, even with the thickest mists and most adverse atmospherical conditions.

On April 16 I left Naples for Mombasa. The following were the names of my companions: Captain Cagni, of the Italian navy, charged

with observations general, and specially magnetic; Lieut. Winspeare, also of the navy, charged with observations general, meteorological, and topographical; Dr. Major Cavalli Molinelli, physician, and charged with zoological and botanical collections; Signor Sella, photographer; Dr. Roccati, geologist, and charged with zoological and botanical collections; two Alpine guides, Giuseppe Petigax and Cesare Ollier, and two porters, Giuseppe Brocherel and Lorenzo Petigax, all four of Cormayeur; an assistant photographer, Erminio Botta, of Biella; and a cook, Gini Igino, of Acqua Pendente.

The complete camp-material (tents, beds, sleeping-sacks, seats, tables, baths, stoves, hermetically closed cases for clothes, photographic material, provision for botanical, mineralogical, and zoological collections, sporting guns and ammunition) was divided into 114 cases, each weighing 50 lbs. English. These were numbered and arranged so as to be easily carried by the porters on their heads. The provisions were divided into 80 cases, each also of 50 lbs., and each containing provisions for one day for twelve persons. The cases were of tin, soldered and protected against hard knocks by a thin wooden casing. Forty of these cases were intended to supply the party between Entebbe and Fort Portal, and in these there were no preserved meats, since fresh meat can always be obtained on the march. The remaining 140 cases, destined for the mountains, contained meat preserves. The total weight of goods to be transported from Entebbe to the slopes of Ruwenzori demanded 194 porters.

On the morning of May 3, after a voyage of seventeen days, broken only by short stays at Port Said, Aden, and Jibuti, the white houses of Mombasa were in sight, and soon afterwards we anchored in the port of Kilindini. Here the English, French, Austrian, and German boats call. Until a pier connected with the Uganda railway is finished, merchandise is transported to the custom house at Mombasa by means of the narrow channel which unites on the west the harbours of Mombasa and Kilindini.

May 3 was spent from morning to night in the laborious task of disembarking our baggage and loading it on the train, and we owed it to the kind assistance of the English officials, and the privileges which were allowed to us, as well as to the help of our fellow-countrymen, that we were able to start on the next day. I was anxious to make our stay at Mombasa as brief as possible. This port marks the entrance to the malarious zone, which from the time of my leaving Italy I had determined to cross as rapidly as possible, in order to avoid the risk of fever among the persons attached to my expedition.

Unfortunately, and with the greatest regret, at the very outset of our expedition we were forced to leave behind at Mombasa one of our companions, Winspeare, who, having fallen sick of typhoid fever during the last days of the voyage, was not in a condition to continue the journey.

With the approval of Dr. Cavalli, he was left in the hospital at Mombasa, so that he might return to Italy as soon as his health should allow him.

On the morning of May 4 we started with the weekly train for Port Florence. The line, 640 miles in length, was begun in 1896 and finished in 1902. It rises from the sea to a height of 7330 feet, to descend to 3675 feet on Lake Victoria. The average pace of the trains is 20 miles an hour, and allows the traveller to admire a perpetually changing panorama. From the tropical landscape, the woods of bananas and palms in the vicinity of Mombasa, the line rises gradually to the wide Athi plains, a great game preserve full of zebras, gazelles, antelopes, rhinoceroses, and lions. Beyond Nairobi (the new capital of the East African Protectorate) the train mounts again on the slopes of the heights which form the eastern boundary of the great Rift valley, the colossal chasm which extends from Lake Nyasa on the south to Lakes Rudolf and Margherita on the north. Wandering amidst the most luxuriant vegetation, now circling round the crests of steep spurs, now penetrating the recesses of narrow solitary glens, the line reaches Limuri. At this station the long descent into the Rift begins, and, after making a semicircular loop and traversing several lofty viaducts over deep wooded ravines, the train passes the base of the extinct volcano of Longonet and the shores of Lake Naivasha, before again climbing to Njoro, the highest point on the line on the western barrier of the Rift.

Along the line and at the stations are seen half-naked natives with no clothing but skins, and their hair and faces dyed a ruddy tint. The men are of proud aspect, many armed with spears and shields; the women, some of whom carry their infants on their backs, have their arms and legs decorated with brass spiral ornaments which impede their movements, and are disfigured by enormous earrings of the shape of tambourines, which are fixed on the lower lobe of the ear. Beyond Njoro the rail descends the Mau escarpment across vast expanses of country covered with elephant grass, to Kisumu or Port Florence, the head of the line on Lake Victoria, whence the steamer for Entebbe starts. We reached Kisumu at 11.30 on May 6, having made in forty-eight hours a journey which a few years ago took nearly three months to accomplish. Once more man has proved here what he can do when his daring undertakings are supported by a clear understanding of the aim to be attained, and by an unrelenting will. While our goods were being embarked, I visited the famous market of Kisumu, where thousands of men and women clad in their best clothes, those provided by Nature, come to traffic. It is remarkable that in this part of Africa, we meet alternately with races who go completely naked, and others who are fully clad, without, as it would seem, morality being in any way the gainer by the greater appearance of modesty. The money current throughout Uganda

is the Indian rupee; cowries are still employed, but only in petty transactions.

On the same day, the 6th, we left Kisumu. The navigation is only by day, and about 6 p.m. we anchored under the island Rusinga. The waves broke with a gentle murmur on the shore; long and narrow canoes, with great beaks on their prows, impelled by twenty or more rowers, alternately approached and quitted the side of the *Winifred*. In the calm water between the reeds, a hippopotamus from time to time raised his huge head, and the birds, seeking their nightly resting-plăces, flew towards the rocks scattered along the shore. The sun sank to the west in a semicircle of fiery clouds, and shot its last ruddy rays on a land which is only now opening itself to civilization. The clouds, after a rapid transition from brilliant red to more delicate tints, seemed to melt and disappear in the shades of evening, which spread rapidly over the lake. Stories of slavery, of cannibalism, of cruel and despotic kings, of bloody battles, of districts decimated by the terrible malady of "sleeping sickness," which has recently invaded this region, rose in succession before my mind. And then to the memory of a wretched past and of a present not altogether prosperous succeeded, in the calmness of the night, the vision of a better future, when, through the exertions of patient and heroic men of science, the scourge which still ravages these people will be vanquished, and on the shores of the lake now devastated by sickness, towns and villages will multiply, and the high plains will be cultivated and covered by the frequent farms of European colonists.

On the afternoon of May 7 we arrived at Entebbe, or Port Alice, the seat of government of the Uganda Protectorate. The town, divided into a European and a native quarter, occupies a fine position on a narrow and lofty promontory between two deep bays of the lake. The European houses are of the type common in tropical countries, with ample verandahs, and surrounded by gardens. Everywhere, on the beds, the windows, and round the balconies, are mosquito curtains, which serve as a protection against the dreaded sleeping-sickness fly. The native dwellings are circular huts.

My reception at Entebbe was almost of an official character. The commissioner, Mr. Hesketh Bell, was kind enough to welcome me and Cagni as his guests, and the other members of my party were hospitably lodged by Messrs. Ennis Wyndham, Carter and Martin. Receiving in their comfortable homes every possible courtesy, we spent at Entebbe a week of great enjoyment. But it was not a time of idleness, for we had to carry through the final preparations for our enterprise, and my work was the harder from having lost the valuable aid of Cagni, who fell ill of typhoid fever almost immediately on our arrival. His fever, not severe at first, increased to such a degree as to necessitate his removal to the hospital, and to make me lose any hope of having his company in my expedition. To await his recovery at Entebbe, which might be delayed

who knows how long, would have been to lose the precious fine weather of June and July, the best months for the mountain, with the risk that while we were waiting another of us might succumb. The decision made before leaving Italy to traverse with all possible speed the malarious zone could not be altered even though it lost me the aid of Cagni, the affectionate, intelligent, and trusted companion of two of my previous journeys.

The dawn of May 14, the day fixed for our departure from Entebbe, was hailed by all with enthusiasm. We left with pleasure the cares of civilized life for the, in many ways, more attractive camp existence. After having bidden farewell to those who had assisted us, and to Cagni, who was in high fever, we met at 8 a.m. in front of the Equatorial Hotel, the appointed place of departure. Here were assembled our porters to the number of 220, almost all Baganda. They were engaged at four rupees a month, to carry on their heads weights up to 50 lbs. over some 400 miles. They had been enrolled by Signor Bulli, an employé of the Società Coloniale Italiana, at the request of the Commissioner of Uganda.

The caravan also comprised twenty-seven more porters in the employ of Mr. Martin (who accompanied us, by order of the Commissioner, as far as the frontier of the district of Uganda), an escort of twenty-six Indian soldiers, the "boys" who acted as our personal attendants, the porters of the headman of the caravan, of the soldiers, and of the "boys," and the grooms for our horses and mules—in all more than four hundred persons. The front of the caravan was already out of sight on the Kampala road when we who brought up its rear set ourselves in motion.

The distance from Entebbe to Fort Portal is about 180 miles. The difference in level (about 1160 feet) is overcome by four steps separated by three basins. The first of these receives the streams that flow to the south into the river Katonga, and so to Lake Victoria. In the second and third basins run the affluents of the Misisi, which flows to the north into Lake Albert. The last of the four steps is the watershed between the waters flowing towards Lake Albert and those flowing to Lake Albert Edward.

The whole of this vast upland between the lakes is intersected in every direction by hills, in the eastern portion close and intricate, in the western on a larger scale and less connected. The vegetation is equally distributed in accordance with the nature of the ground throughout the region—on the hills, tall grass and isolated groups of trees: in the hollows, where the water runs, fragments of tropical forest; where it stagnates, marshes covered with papyrus and water-lilies. The track from Entebbe to Fort Portal, in places a road, in others a mere path, sometimes keeps along the ridges of the hills through the tall grass, sometimes descends into the valleys and traverses the forest.

In the first stages, where the country is most undulating, it is a

CARAVAN NEAR BWEYA, ON THE ROAD TO FORT PORTAL.

continual switchback on rapid inclines. Beyond Lake Isolde the slopes are gentler, and level tracts occur, which serve as oases of rest for the unfortunate porters. Swamps and thickets diminish as Fort Portal is approached, and the country wears a more healthy aspect.

The region is inhabited, and all along the road dwellings may be found, but they are so well hidden in the high grass and the banana plantations as to be rarely visible. The ground is only cultivated in the immediate neighbourhood of the huts, since, as in most tropical countries, the indolence of the natives limits cultivation to what is indispensable for their own maintenance. Bananas, colocarias, potatoes, ignami, beans, cotton, maize, panico sesame, and sugar-canes are cultivated in the plains. Fieldwork is everywhere left to the women.

We were fifteen days from Entebbe to Fort Portal. The marches varied from three to six hours. The start was always made at dawn, about 5.30, and we reached camp at latest at 11.30 a.m. We camped far from villages, on ground prepared for the purpose. Our tents were pitched round a cabin, or rest-house, in which, as a rule, we took our meals. Cabin and tents were surrounded by a high fence, which served not only as a defence against wild animals, but also as a barrier between our camp and that of the porters.

This was composed of a number of cabins, which the porters themselves built with the high grasses in a few minutes. Each held two or three men. Before these cabins the Baganda employed themselves till late in the night cooking the sweet potatoes and bananas which constitute their ordinary diet. Although they had often marched five or six hours over very difficult ground, carrying weights of 50 lbs., they seemed always content with their one frugal evening meal, ready for exertion, and resigned to toils and suffering.

The necessity of attending to a number of details prevented us, during the first few days, from enjoying to the full the picturesque and adventurous side of nomad existence.

But little by little, as the caravan began to organize itself, our life became a source of intense enjoyment. Our camp was teeming with humanity, and animated by the games and dances of the natives. Now some chief would arrive with gifts from the neighbouring villages, now a train of women carrying food for the caravan. The hours passed quickly, and the mind found difficulty in registering the innumerable new impressions which awaited it, and which, after all, formed but a frame to the purpose which preoccupied us, to push forward without a halt in our undertaking.

The temperature was pleasant in the morning and evening, cool during the night, and warm in the middle of the day. After supper we met round a large fire lit in the centre of the camp. This served not only for warmth, but as a precaution against the minute enemies that carry malarious fever.

This seems to me the occasion for a brief parenthesis as to the use of quinine as a propylactic. Some of those who have resided in Africa for lengthened periods throw doubts on its merits used as a preventive, and, in proof of their belief, cite their own immunity without use of the drug. I should refer this to their constitutional indisposition to malarial infection. It is conceivable that, for persons obliged to inhabit permanently malarious localities, the continuous use of the remedy may be worse than the disease. But for those who have only to traverse an infected zone, I believe it to be prudent to follow the established custom and take daily moderate doses of quinine.

Although in this district elephants abound and lions are not infrequently met with, as also are zebras and antelopes, we did not pursue them. Small game was abundant—a short stroll round camp sufficed to procure a provision of guinea-fowl.

Proceeding thus, without fatigue or delays, we reached the frontier of the province of Uganda between the camps of Lwa lumutkuza and Kichiomi. Here we parted with regret from the sympathetic and jovial Mr. Martin, and continued our march with Mr. Knowles, the Acting Commissioner of the Western Province. In the measure that we approached nearer to the western lakes, the hope of seeing the chain of Ruwenzori grew stronger. Twice we almost believed we had recognized it, but in each case we were deceived by the white clouds, which piled themselves up in the form of an immense snowy mountain mass. At last, two days before reaching Fort Portal, a short distance from the camp of Kaibo, Ruwenzori appeared suddenly in the west, towering above the mists that hung round its flanks. We distinguished several summits with extensive glaciers, the lower portions of which were concealed by lofty spurs, and among these summits the loftiest was crowned by three peaks, the southernmost of which was separated from the others by a deep depression. This was the summit recognized as the highest by Freshfield, and identified by him wrongly with Johnston's Duwoni, which had been named Moebius by Stuhlmann. Next day, from Butiti we again saw the snow-peaks, but, being nearer, the spurs hid more of them. From Fort Portal no part of the loftiest summit is visible, though the tops of the more northern peaks are just seen over lower ranges.

On May 29 we reached Fort Portal, the westernmost British military station in Uganda.

Mr. Knowles had, with kind forethought, begged Dr. Wollaston, of the British Museum party, to come to Fort Portal and give me news of his attempted ascents of Kiyanja and Duwoni* in the preceding month. Dr. Wollaston informed me of his ascent of a point not the highest on the Kiyanja ridge, and of his ascent of a peak he believed

* The summit east of Grauer's gap I propose to call Wollaston peak. See note on map as to Sir H. Johnston's two Duwonis.

to be Johnston's Duwoni, the summit on the right looking up the ice-fall of the Mobuku glacier. He told me that this peak was lower than Kiyanja, and informed me of the existence of two snow-peaks higher than Kiyanja and north-west of it. He could not tell me how these peaks were connected with Kiyanja, confining himself to an opinion, which proved erroneous, that they were situated west of the watershed. This information contradicted that which I had previously derived from Freshfield, and left me uncertain as to how to reach the highest peaks. Should we follow the Mobuku valley, or the Butagu valley on the Semliki side which had been taken by Stuhlmann? If the highest peak was in fact divided from Kiyanja by a deep valley, and if the passes leading to it from the Mobuku were impracticable, how could we transport our camp across the range? In this case the better course might be to take the Butagu valley. But to reach the latter we must make a circuit round the southern flank of the chain, and traverse part of the Semliki valley, where we were uncertain whether we should find local resources sufficient for our caravan, or a friendly welcome from the inhabitants. Of the two alternatives we chose that which involved the shorter journey —to ascend the Mobuku and determine on the spot whether we must cross to the Semliki side.

Fort Portal is situated 5036 feet above sea-level, in a healthy situation in a wide amphitheatre, enclosed on the west by Ruwenzori, and on the east by the hills that form the watershed between Lakes Albert and Albert Edward. The Europeans resident there, including ladies, number fifteen—the Commissioner, the Collector, the commander of the troops, and the Protestant and Catholic missionaries. The country round it is well cultivated. In the land belonging to the Catholic mission all European vegetables are grown and flourish.

We rested at Fort Portal on May 30 and 31, and this halt was pleasant to all, and specially to the porters, many of whom, from having walked barefoot, had sore feet.

On June 1 the caravan was again in motion. We made a short halt before the royal residence in order to pay our respects to the merry King Kasagama and his friendly and still merrier prime minister, and another at Notre Dame de la Neige to bid farewell to the excellent fathers of the French mission. Then we marched south towards the Mobuku, accompanied by the Collector, Mr. Haldane, Mr. Knowles, and Dr. Wollaston. The last named left us in the evening to join the British Museum party in the valley of the Nyamwamba.

We reached Ibanda in the Mobuku valley in three marches, halting at Duwona and Kasongo. The country, though fertile, is little cultivated. We crossed several streams, two only, the Wimi and the Mobuku, of sufficient importance to delay the passage of a caravan or to hinder it when in flood. Owing to the dryness of the season, we had no difficulty with the Wimi; to traverse the Mobuku we made use

of a rope, below which the natives of the district stationed themselves so as to rescue any men or burdens that might be carried away by the stream. Although the weather was fine, we saw no more of the snow-peaks, which were hidden by the lower ranges. But on leaving Kasongo on a glorious morning, and descending into the Hima valley, we again saw two rock peaks,* and beneath them a large glacier. Marching continually to the south, the rock peaks disappeared, and we could see only the two summits visible from Kaibo and Butiti, and recognized by Freshfield and ourselves as the loftiest. When we had descended into the Mobuku valley, a new peak of mixed rock and snow came into sight, with a large glacier on its north, which we quickly recognized as the Duwoni of Sir H. Johnston's illustration.† We were thus more fortunate than our predecessors in seeing the chain first from a distance and again before entering the Mobuku valley, and we felt confident that the peak we and Freshfield held to be the highest was perfectly distinct from Johnston's Duwoni.

The chief's residence at Ibanda is situated in a part of the valley where it expands into something of a basin. At the head of the valley rises a lofty rugged summit, over which towers the snowy block of Duwoni.

The day, serene when we reached Ibanda, sank into a still clearer night. The waters of the Mobuku murmured at my feet; below our camp burnt a hundred fires, which appeared and disappeared from moment to moment, according to the grouping about them of our porters. The valley's outlines were visible under the starry sky, but my eyes were irresistibly attracted towards the white snows of Duwoni, with a gaze of hope such as that which, on a black and stormy night, the sailor turns to the lighthouse of a hospitable port.

On June 4 we left Ibanda, our porters encouraged by a splendid morning. They started at a good pace up the level valley, until they came to a hill-side so steep as to take away the breath even of unburdened men. Our caravan, so cheerful at the start, became silent. After two and a half hours' march we reached Bihunga, with but a very small portion of our following. Bihunga is 1791 feet above Ibanda, and 6320 feet above sea-level. Its huts are the highest dwellings of the Bakonjo, mountaineers of gentle manners and peaceable habits, who, despite the rigours of their climate, go habitually naked. The British Museum party had spent several months here, and their stay was recorded by a commodious hut, which we used as a storehouse for some of our loads. We had no little difficulty in pitching our tents on the very scanty level ground, which hardly afforded room for them. From the camp we had a fine view over the lower part of the valley, in which, however,

* From Sella's photographs, we afterwards recognized them as the points named on the map Elena and Savoia.

† 'The Uganda Protectorate,' vol. 1, p. 158.

the waters of Lake Ruisamba were not visible; looking upwards, the view was limited by a projecting spur. The next day, again favoured by the weather, we advanced to our next camp. The path, on leaving Bihunga, climbed the spur just mentioned, and then, descending steeply, crossed the Chawa and entered Mahoma, through a splendid forest of podocarpus, tree-ferns, and laurels, shut in between lofty rugged slopes, also covered with the densest vegetation. The path then climbed again on the spur which divides the Mahoma and Mobuku torrents, following its actual crest as far as Nakitawa.

The descent into the Mahoma valley, over very slippery ground, had already delayed the march of the porters, which was still further slackened by the steep climb to Nakitawa. We took four hours to reach this spot, and most of the porters were much longer. The refuge of Nakitawa, 1417 feet above Bihunga and 8602 feet above sea-level, lies under the shelter of a huge erratic block perched on the brow of the ancient moraine, which now divides the valleys of the Mobuku and Mahoma. Many hundred feet under the camp is a steeply inclined hollow, once the bed of a glacier, but now the channel of a torrent, which continually erodes it. Opposite our camp towered majestically the broken walls of the Portal Peaks, between which opened a valley, which seemed to lead to the Duwoni seen from Ibanda. We had believed up to that time that the Mobuku flowed from that mountain, but we were now inclined to think that its meltings joined the Mobuku below our camp.

Previous explorers had recommended the Mobuku as the best way to the upper ranges, and naturally, in the absence of other reasons, we had determined to follow their counsels. But since reaching Ibanda doubts had arisen in my mind as to whether we were taking the best road to the snows we had had in view. It seemed to me that this road was to be sought in the valley that opened opposite Nakitawa, which would lead to the Duwoni of Johnston, while we, by following the Mobuku, should increase our distance from Duwoni and place another ridge between ourselves and that peak.

At Nakitawa we left more than half our Baganda porters. With those who remained and some ninety Bakonjo we resumed our march on the 6th, no more favoured by fine weather, but in fog and rain. As far as Nakitawa there is a path, beyond it comes to an end. We walked at first on the crest of the moraine, opening a track between the stems of the bamboos. We next traversed a swamp, where we sank to the knees. Then crossing to the left bank of the Mobuku, and always wading in mud, we reached, after four hours, the refuge of Kichuchu. We arrived in a wretched state, exhausted by the traverse of so much swampy ground, and drenched by the rain and the moisture that dripped from the trees and grasses.

The refuge of Kichuchu is 1131 feet above Nakitawa, and 9833

feet above sea-level. An enormous cliff of overhanging rock supplies, for the narrow space immediately below it, a very inadequate shelter against the weather. In this space the soil, if protected from the beating rain, is made moist by the water which streams down the face of the cliff. We succeeded in erecting three of our tents under the protection of the cliff. The bad weather, the detestable path, and above all the want of provisions, deprived us of the aid of the last Baganda who had remained. We could not compel them to follow us as we could not assure them their daily food. We abandoned some of our loads, and went on with only Bakonjo porters.

Leaving this camp, one climbs for about 1000 feet by a narrow natural gully cut in a rocky barrier. This staircase brought us to a plain and a wood of tree-heaths, where our march was impeded, not only by the branches and trunks of these plants, but also by a deep-lying layer of the trunks and branches of an older forest buried in moss and fallen to the ground for who knows how many years. The Bakonjo, with 40 lbs. and more on their heads, walked like so many squirrels, bending so as to pass their loads under the trees, or leaping from trunk to trunk with such agility that we had difficulty to follow them.

We recrossed the Mobuku to its right bank, and found ourselves before another step in the valley, about 650 feet high. Above it we were met by an unexpected sight. A long level valley enclosed between steep walls stretched before us, ending in another ascent, beyond which lay the highest refuge, Bujongolo. The bottom and sides of the valley, as far as the eyes could reach, were entirely covered with a fantastic vegetation. Bushes of Helichrysum with white everlasting flowers carpeted the ground, over them rose the tall funereal stems of lobelias and the monstrous growths of gigantic *Senecios*. Despite all this exuberance of vegetation, there was an absence of any feeling of life; the only familiar sound was the light murmur of the cascade close to the refuge of Buamba. We arrived at the refuge of Bujongolo in about four hours; but many of the porters, who were less affected than ourselves by the love of mountains, remained behind at Buamba. We were therefore compelled to pass the first night without tents, and some of us without a bed. After fifty-four days' travel and a journey of 6000 miles, we had at last arrived at the foot of the range we proposed to explore.

The refuge of Bujongolo is formed, like that of Kichuchu, by a rocky wall that overhangs, and is even less convenient than the former, on account of the many blocks that have fallen from the wall and made the ground so uneven that it is only possible to plant a single small tent. We decided, therefore, to construct platforms by cutting down some trees, and thus obtain sufficient space to set up our six tents, which were arranged at different levels in two groups, separated by an enormous block. To pass from one group to the other, we were

forced to take a shower bath, for from the brow of the rocky wall that made a roof to our camp there fell, even in fine weather, a continuous dripping, or else to find a passage by acrobatic exertions between the block and the rock-wall. The Mobuku flowed at our feet in a deep ravine, which open to the west only, allowed our eyes to wander to the snowy southern slopes of Kiyanja.

On June 9 our little camp was all movement, for Knowles and Haldane were returning to Fort Portal, taking with them my sincere thanks for the valuable help which they had given me in pushing forward the expedition, and the Bakonjo porters went down to fetch the loads left at Nakitawa and Kichuchu. I, with my Alpine guides and five Bakonjo, set out to reach the watershed. We followed the Mobuku in the tracks of the earlier explorers to the last camp made by Grauer near the glacier. Here the guides took the lead, and, still following for a time the route taken by Grauer, and then keeping to the rocks on the right (ascending) of the glacier, we easily reached the icefall. We induced the natives to follow us for a short time, but, being without shoes, they slipped more than we did on the mossy slabs, and cut their feet on the sharp stones. At 13,780 feet, a greater height than they had ever reached before, we were compelled to leave them. Clouds had now come up, and we were forced to camp.

Next day, favoured by fine weather, we reached the crest in three-quarters of an hour, over slightly crevassed snow-slopes. This three-quarters of an hour seemed to me a century, and I pressed the guides to a pace which brought us all breathless to the top at dawn. We were on the lowest gap in the ridge which connects Kiyanja with the peak to its east climbed by Wollaston. The cloudless sky allowed us to see all the snowy peaks which constitute the loftiest part of the chain. On the north the ridge we were on fell in a precipice. Opposite us in the same direction appeared four distinct mountains, with snowy peaks far loftier than our standpoint. The two central mountains were almost in line. The western, and nearest to us, was crowned by four peaks, disposed in pairs in two groups; the northern pair were separated by a marked saddle, and were the loftiest in view. They were the points seen by Wollaston, and identical with those seen by us from the Hima valley, and previously from Butiti, which had presented themselves as the highest of the range, and any doubts that might have existed as to their importance were removed now that we found that they were the most western and distant of all.

The two glens that separated the two outside from the two central groups of summits met at our feet in a valley, which ran parallel to the ridge on which we were standing. We were unable to ascertain as yet the lower course of this valley, but we saw enough to enable us to feel sure that it drained towards the east. In our subsequent expeditions we identified it as the valley of the Bujuku.

The peak to the east of the Mobuku glacier, climbed by Wollaston, which had proved to be lower than Kiyanja, could not, we saw, be the Duwoni visible from Ibanda, but was a secondary summit not on the watershed.

It was only 6.30 a.m., and we had all the day before us. The weather was fine, and we decided to climb Kiyanja in order to reconnoitre the route we should have to take in order to reach the well-marked saddle between the two highest peaks. We descended on to the glacier south of the crest, and then returned to it and followed it to the summit. Meantime clouds had gathered. In the short breaks in the vapours we saw a great depression between Kiyanja and a snowy mountain situated to the south (Freshfield's "Southern Peak"), which formed a col, leading on one side to Bujongolo, on the other to the Semliki. There seemed no difficulty in crossing this pass, and so reaching the valley between Kiyanja and the highest peaks. It was warm (43° Fahr.), and we rested for four hours on the rocks, waiting for a clearance, which never came. At 1 p.m. we left the top. Returning in our footsteps, we gained the camp from which we had started in the morning at 3.30 p.m. Here we found Sella, who had climbed thus far in order to take a photographic panorama.

Next morning we returned to Bujongolo. Rain kept us prisoners there on the following three days, June 12, 13, 14. It was useless to attempt to move in thick fog and pouring rain. Had we started, our Bakonjo porters would not have followed us. We remained during these three interminable days confined in the narrow dungeon, which hardly held our tents, and buried in dark, dank fog. Even at night there was no peace. On some of our tents the water from the rocky brow overhanging them dripped continually with a monotonous and irritating noise. The only incident was a call from a dangerous and uninvited visitor, a leopard, whose tracks we had already noticed. On one night he devoured two sheep; on another, while I was sitting before my tent, he approached me within a few feet. The animal fled as soon as I rose, but I was left uneasy at his presence almost inside our camp. For the porters, who slept without shelter, and for the men sent out to fetch water, the vicinity of the beast was a real danger.

On the night of the 14–15th an east wind rose and partially dissipated the clouds. In the morning, under a clear sky, we left Bujongolo with our Alpine porters and guides and nine Bakonjo, having thus assembled all our available forces. At the angle where the Mobuku valley bends north, we turned to the left and made a circuit under the southern slopes of Kiyanja. The ground was, in consequence of the rain of the three preceding days, very bad going. After an hour's walk we were wet through, covered with mud, and furious at having to walk over swamps and slopes in which we alternately sank up to our knees or slipped back twice as far as we had intended to step forward. To

render our march still more disagreeable, the mists came down on us. The descent on the Semliki side was worst of all. The guides in front had to hack out a path with their axes through the thick bushes of *Helichrysum* and *Senecio*. Rock-buttresses forced us to long circuits to turn them, and our native porters, weary and little willing to follow us into Congo territory, halted and required aid at every moment.

About 4 p.m. we reached two lakes, the waters of which, hardly rippled by the breeze and the movements of wild ducks, reflected on their surface the white peaks of the surrounding ranges.

The evening was splendid, and put an end to our bad humour. The sun descended over a broad valley, which opened to the west, into a bank of clouds, to break out again below them before it sank finally beyond the great forest of the Congo. Not only the horizon, but the whole atmosphere was suffused with a rosy tint, which made the valley and the vast forest appear as if wrapt in flame.

To induce our porters to start on the next morning was no easy matter. Full of distrust, and ignorant as to where we were taking them, they sought every possible excuse for delay. Being without an interpreter, we could neither understand their remonstrances nor explain our own plans. My patience and that of the guides was on this march sorely tried.

Next day we lost much time in forcing a way through the thick bush on the side of the lakes. Then we followed the valley, keeping under the cliffs of Kiyanja. In two days we transported our camp to the glacier which descends from the group we wished to climb into the valley we were traversing. A steep pass divides this valley from that we had seen under Grauer's gap.

The northern face of Kiyanja fell almost perpendicularly on the valley we had traversed. The mountain which we had already seen to the north from Grauer's gap bore on its western flank a large glacier. Between this mountain and that on whose slopes we were was the deep valley and lake visible from the gap. The waters of this lake drained into a valley, which runs at first parallel to the ridge which unites this gap to Kiyanja, and then bends to the south under several peaks east of that climbed by Wollaston.

The mountain with a large glacier to the north-east of the camp was the Duwoni seen from Ibanda, and the valley to the east of the camp was the head of the valley which opens opposite Nakitawa. It was now beyond doubt that Grauer's gap was not on the watershed. All the torrents which unite in the valley to the west of Grauer's gap are tributaries of the Mobuku.

We sought rest in a state of nervous anxiety. It was not the roughness of the rocks which kept off sleep, so much as our fears lest the weather, which had grown less settled during the day, might force us to remain camped who knows how long, here at the very foot of the desired peaks.

At dawn the heavens gave no fair promise, but we started, nevertheless, Petigax leading, Ollier next, I third, and Brocherel bringing up the rear. In an hour, over easy slopes, we gained a level glacier broken by but few crevasses. The twin peaks, separated by their characteristic saddle, faced us close at hand. It was 6.30 a.m. The sun shone for a moment, and then hid himself in the clouds that rose from the east. Soon we began to feel puffs of wind from the south-east, which rapidly increased in force, and halfway across the plateau the mist enveloped us. Petigax marched on, and led us to the ridge which fell from the southern and lower of the two highest peaks. The snow was in good condition, and after cutting a few steps we gained the top at 7.30 a.m.

In the dense mist we could not even see the higher peak, which was only a few hundred yards off. On the previous day our guides had noticed that there might be difficulty in climbing from the saddle to the higher peak on account of its overhanging cornice, and in the fog we could neither reconnoitre the descent from our own peak to the saddle, nor the best means of dealing with the cornice. We must either put off to another day the ascent, or descend the ridge we had climbed, pass under the saddle, and attack the higher peak where there was no cornice, or attempt a direct passage by way of the saddle. The guides said nothing. It would have been useless for me to suggest to them to go back, and we resolved to take the saddle route, reserving to ourselves the alternative and more circuitous route should the former prove impracticable. The excellent condition of the snow made the descent to the saddle shorter than we had anticipated. We climbed up by a very steep snow-slope to the cornice. We had to evade the icicles and ice-columns that hung from and supported it in order to find a means of gaining the ridge. The slope was so steep that my head almost touched the feet of the guide in front of me. In cutting steps Petigax sent down a shower of ice on his followers, and I looked forward with pleasure to the moment when our party would resume its normal relations—one in front, and not one above the other. We found at last a sort of ice chimney 6 feet high. Petigax, to climb up it, had to plant his nailed boots on the head and shoulders of the unfortunate Ollier, who served him as a mounting block. The ridge was ours, and at the same time the top.

It was 11.30. A fresh breeze blew from the south-east; the clouds swept past but few yards under us, leaving clear only the two peaks, that we had left and that on which we were standing. And to these summits, the only ones in view at this moment which crowned my efforts, I gave the names of Margherita and Alexandra, in order that, under the auspices of the two royal ladies, the memory of two nations may be handed down to posterity: of Italy, the name of which resounded for the first time on these snows in our shout of victory; and of England, which in its marvellous colonial expansion carries civilization even to the slopes of these remote mountains.

Mount Baker.

Mount Stanley.
Queen Margherita Peak.

Mount Stanley.
Queen Margherita Peak.

Queen Alexandra Peak.

King Edward Peak.

Mount Baker.

Grauer Rock.

Wollaston Peak.

Moore Glacier.

THE HIGHEST PEAKS OF RUWENZORI.

Having unfolded the little flag which had been given me at Rome by Her Majesty Queen Margherita before my departure, I fastened it to a staff planted on the highest point of the snowy dome, to the triple cry of "Viva Margherita!" "Viva Alexandra!" and "Viva l'Italia!" The winds blew out the tricolour above the snows, which up to that time had known nothing but the breath of the tempest, and the little letters of the motto which the august lady had had embroidered on the flag, "Dare and hope," were displayed to our view. The minute letters, beaten by the winds, may disappear, but the words will remain attached to the name of this summit, as if they were engraved on its rock in indelible characters, and will serve, as they did to us, as an encouragement and support to all the hardy explorers who, among the still unknown and savage wilds of Africa, labour among hardships and perils for the advance of civilization.

The moment has now come to call your attention to the sketch-map, on which are shown the several snowy groups which constitute the culminating portion of the Ruwenzori range, together with its passes and valleys. This map is based on observations carried out often under unfavourable atmospheric conditions and not always with instruments of great precision; but, having regard to the number of observations on which it is based, I believe it will be found approximately correct.

Some of the mountains were seen by Stuhlmann from the west, or by Johnston and Moore from the east. Stuhlmann gave them both native and German names, Johnston only native names. In some cases confusion has been caused by one mountain having three names: a German, Semper, and two native, Kiyanja on the east, Ngemwimbi on the west. On my return from Africa, I had the pleasure of meeting Sir H. Johnston and Dr. Stuhlmann, and discussing with them this knotty question of nomenclature. The question was somewhat delicate, but we resolved it easily, because we found ourselves in agreement. To give native names seemed undesirable, because the natives do not distinguish the peaks, but only the valleys. In giving European names, the better course appeared to be to use, for the several groups, the names of explorers connected with this region. Dr. Stuhlmann begged me to leave the names he had introduced to individual summits, and I have yielded with pleasure to this suggestion.

I propose, therefore, to call Mount Stanley the mountain or massif that carries the five highest peaks—Margherita (16,816 feet), Alexandra (16,750 feet), Elena (16,388 feet), Savoia (16,340 feet), and Moebius (16,214 feet). To the second group in order of height, the Duwoni seen from Ibanda, I give the name of Speke, in memory of the discoverer of the Ripon Falls, the origin of the Nile; and the highest peak of this massif I call after the King of Italy, Vittorio Emanuele (16,080 feet); and the lower and more southern seen from the lower Mobuku valley I

name after Sir H. Johnston (15,906 feet). To the third massif (Semper, Kiyanja, or Ngemwimbi) I give the name of Mount Baker, in memory of the traveller who discovered Lake Albert, and was the first to see these mountains, calling its highest point (15,988 feet) after the King of England, and the lower to the west we first climbed Mount Semper (15,343 feet). The fourth massif I call Mount Emin, after the traveller who succeeded Stanley in this region; its highest points Umberto (15,807 feet) and Kraepelin (15,752 feet). The fifth massif I name Mount Gessi, after the Italian traveller who first circumnavigated Lake Albert; and I name the two points of this group Yolanda (15,647 feet) and Bottègo (15,483 feet). To the sixth massif I give the name of Thomson,* in honour of the traveller to whom we owe the progress of civilization in these countries, naming its peaks Weismann (15,273 feet), Sella (15,286 feet), and Stairs (15,060 feet). For the point climbed by Dr. Wollaston, and thought by him to be Duwoni (15,286 feet), I propose the name of its climber; for the northern top (15,269 feet) that of Moore; the name of Cagni for the rock-peak opposite Bujongolo (14,826 feet).

I have left their native names to the valleys, torrents, and lakes, where these had any single name given them by the Bakonjo; where they differed, and in the case of all the valleys, lakes, and torrents on the Semliki slope, of which the Bakonjo know little, I have given no names.

I have called the passes we visited after Freshfield, Scott Elliot, Stuhlmann, Cavalli, and Roccati, leaving nameless the gap between the Yolanda Peak and the Portal Peaks, because I could not exactly determine its position. These passes range between 13,780 and 14,180 feet, except the Stuhlmann Pass, which is slightly lower.

The watershed runs from the Weismann Peak over the Freshfield Pass to the King Edward Peak, follows the crest to the east as far as the Scott Elliot Pass to climb over the summits of Mount Stanley, then by the Stuhlmann Pass to the Vittorio Emanuele Peak, whence by the Cavalli Pass to the Umberto Peak, and so by the Roccati Pass to the Bottègo and Yolanda summits. It then follows the ridge that drops from the Yolanda to the south-east to join the Portal Peaks, and from these turns again north-east.

The waters of the Bujuku are fed by the principal glaciers of the Stanley, the Speke, and the Gessi groups, and are more considerable than those of the Mobuku, which receive only the glaciers of the Baker. The Mobuku, therefore, ought to be considered a tributary of the Bujuku, and the lower valley ought to be known as the Bujuku. The pass at its head is also lower than that at the head of Mobuku.

Even when the weather was fine, the distances in the views from the higher peaks were always more or less veiled by haze, which made it difficult to determine the direction of the valleys falling towards the Semliki. It may, however, be pointed out that the four valleys leading

* See footnote, p. 121.

QUEEN MARGHERITA AND QUEEN ALEXANDRA PEAKS FROM LAKE BUJUKU.

to the Freshfield, Scott Elliot, Stuhlmann, and Cavalli passes all unite to form the Butagu. The Butagu draws its waters from the glaciers of Mount Stanley (except the Margherita Glacier), from those west of Mount Baker, from the Thomson Glaciers, and a good part of the Speke and Emin Glaciers. It is, therefore, the most important torrent of the western slope. The Wimi is not a glacier stream. The Nyamwamba, Russirubi, and Rudma may be fed by the glaciers on Mounts Thomson,* Emin, and Gessi.

I now return to the events of June 18, on which we climbed the two highest peaks. On the 20th we again climbed the Alexandra, and then went on to the Elena and Savoia, returning directly to our camp by a large couloir below the Savoia. On the same evening Cagni, Sella, Cavalli, and Roccati arrived in camp, Cagni looking very well and delighted to join us. His fever had allowed him, not only to recover rapidly, but to make the march from Entebbe to Bujongolo in twelve days. This and the following day we held festival.

On the 22nd we again separated. Sella and Roccati remained at the camp to climb Mount Baker; I and the three guides, with some Bakongo, started to climb various snowy summits, the King Vittorio Emanuele, Umberto, King Edward, Stairs, Wollaston, and Moore peaks. This we accomplished between June 22 and July 10. Fine weather favoured us only in the final days. We twice climbed the Speke and King Edward Peaks; we remained for eight hours on the Umberto without seeing anything. Our negroes lacking provisions, we were forced to return from our seventh camp to Bujongolo, marching for three days under rain. From the Stairs Peak we had a splendid view of the King Edward and Wollaston and Moore peaks. These ascents were all easy; we found the rocks easy and the snow in perfect condition. Even on the Margherita Peak the difficulty we encountered could easily be avoided by taking the eastern ridge. On our return to Bujongolo, we could feel satisfied that we had completely explored this side of the chain; the highest peak and thirteen others had been climbed, and the heights of all of them determined.† Cagni had finished his magnetic observations, measured a base

* See footnote, p. 121.

† With the exception of the Yolanda Peak, the height of which is the result of boiling-point readings, all the heights depend upon mercurial barometer observations referred to Bujongolo as a lower station, the height of Bujongolo above Fort Portal having been previously determined by a series of barometer readings extending over a month, reduced as nearly as possible to the same time, at each place. The height of Fort Portal above Entebbe was in the same manner determined by a comparison of mercurial barometer readings taken at these two places, but in this case the series of readings extended over a period of three months. The following are the figures for these three places:—

Entebbe	3862 feet (barometer cistern)
Fort Portal (near Collectorate) ...	5026 feet (barometer cistern)
Bujongolo	12,461 feet.

The height of the barometer cistern at Entebbe depends upon the surface of the lake

near Bujongolo, and connected with this the King Edward and Cagni peaks. He had also climbed the last named, and connected it with those I climbed. He had fixed the geographical position of one of the extremities of the base. Sella had succeeded, by means of admirable perseverance, in obtaining views and panoramas from the King Edward and Stairs peaks and the Grauer gap. To secure good photographs on the peaks of Ruwenzori is no easy task. If the air is sometimes clear in the early morning hours, the light is insufficient; and when the light becomes good, the clouds have risen. It may be enough to say that in order to take the panorama from the King Edward Peak shown here, Sella had to camp for a week close to the Freshfield Pass, and to climb the peak several times to secure the favourable moments.

We now resolved to leave Bujongolo and descend to Ibanda, Cagni and Roccati, by the Mobuku path, Sella and I by the Bujuku. Crossing the Scott Elliot Pass, in two marches we descended to our ninth camp, situated at the point where the Bujuku receives its tributaries, the Mijusi and Kurungo. After July 4 fine weather set in. The soil dried, and our marches became less laborious. From our camp the peaks of Mount Gessi were visible at the head of the Mijusi valley, and we could not make up our minds to abandon this region without climbing them. One day's march took us to the foot of the Yolanda Peak, and on the next day we climbed it and the Bòttego. Owing to the clearness of the day, we could distinguish the watershed running north-east from the Portal Peaks, in a chain lower than the Portal and without permanent snow. To the north-west we had the King Vittorio Emanuele Glacier, the largest of the group. On the east, both Mount Emin and Mount Gessi have no glaciers of any size. The Margherita, Alexandra, Savoia, and Elena peaks were all in sight, and appeared over those of Mount Speke. The snowy summits of a chain, until within the last two decades shown only on the maps of ancient geographers, rose before us. We gazed long on the shining glaciers of the Nile which have through the centuries fed the sources of the majestic river linked to history by so many records of the past, and we bade farewell reluctantly to the virgin summits which we had been the first to subdue.

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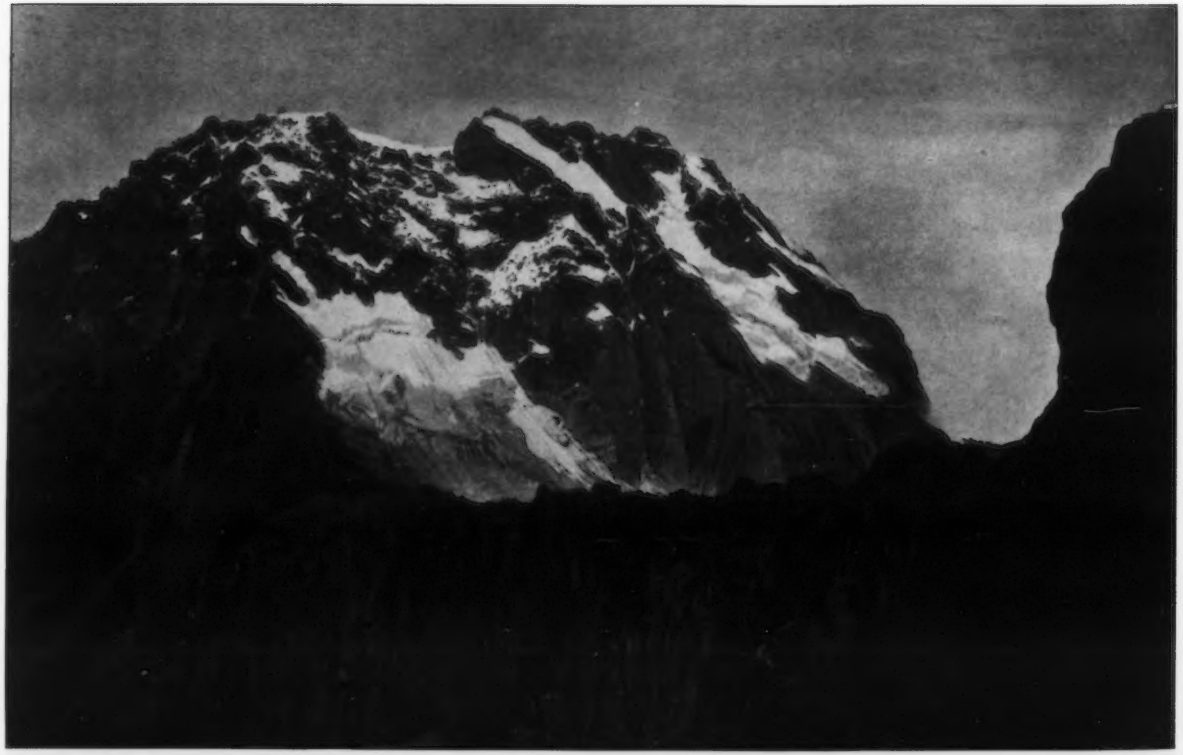
being 3726 feet, but according to Captain T. T. Behrens, R.E., of the Anglo-German Boundary Commission, the lake is only 3720 feet.

As the height of Fort Portal, which was our first station to be determined after leaving Entebbe, has not yet been definitely fixed trigonometrically, some correction may have to be made to the height of Bujongolo, which depends upon Fort Portal, and consequently to the heights of the peaks depending upon Bujongolo; but probably the necessary correction will, in any case, be small, since the barometric results agree (with one exception, for which reasons can be given) within 100 to 200 feet of the trigonometrical determinations of Captain Behrens. In addition to the barometer observations, Captain Cagni fixed the height of the Cagni Peak above Bujongolo by theodolite vertical angles, and from the summit of this peak took vertical angles to the other peaks. The heights resulting from these observations agree very closely with the barometer determinations.



KING EDWARD PEAK, SEEN FROM THE N.W., FROM THE CAMP, N.W. OF SCOTT ELLIOT PASS, NEAR THE ELENA GLACIER.

We descended from camp nine to Ibanda in two marches. We admired for the last time the bushes covered with white everlasting bloom, the branching senecios, the delicate lobelias. Lower down we again encountered the gigantic heaths, the bamboos, the podocarpus, and the laurels. At Ibanda we parted from our brave and faithful Bakonjo, who had been for forty days our companions. The Bujuku valley is longer and more tiring to traverse than the Mobuku, but running as it does to the base of the principal snow-peaks, may be recommended to mountaineers anxious to visit the heights.

On July 21 we were at Fort Portal. The weather remained fine, but the haze cut off all view of the higher range, and we saw it no more. We remained ten days at the Fort, occupied in an elephant hunt in the Kibale forest and in visiting the crater lakes near the station. On August 14 we reached Entebbe, after crossing in canoes a narrow inlet of Lake Victoria. We landed at Jinja to see the Ripon Falls, and thence returned home by the way we had come, reaching Marseilles in the middle of September.

I may add some notes here on the geological structure of Ruwenzori. The theory of a volcanic origin may be absolutely excluded. In the whole upper region visited there exist only at one point, in the neighbourhood of Kichuchu, traces, and those entirely local, of basaltic veins in the gneiss rock.

The dip of the strata, often very high—inclined up to 60°—is, as a rule, east or south-east in the eastern portion of the central group, completely arched towards the south, and tending towards south-west in the western portion so as to form a kind of semicircular outcrop.

The origin of the mountain group of Ruwenzori and of the high peaks of its central portion may be attributed to three causes—geotectonic, stratigraphic, and lithologic—as follows:—

1. To an upheaval *en masse* of a portion of the archæan floor of Central Africa, producing a general dip from west to east in connection with the great western fracture (with corresponding vertical displacements) which produced the valley of the Semliki, as well as with the other fractures observed to the east of the group, which are marked by a series of recent volcanoes, of which those of the province of Toro are examples.

2. To a highly accentuated ellipsoid of upheaval or anticlinal, with strata more or less strongly tilted in the Ruwenzori group, an ellipsoid having its general direction north and south.

3. To the presence in the heart of the group of a series of rocks (namely, amphibolites, diorites, diabases, amphibolitic gneiss), admirably fitted to resist denudation by surface agents, both physical and chemical, to which the gneisses and mica-schists of the outer ranges offer far less resistance.

To these main causes may be added the probable existence of internal fractures, traversing the *massif* in a generally north-and-south direction, which would tend to the separation of the several groups of summits.

An important geological phenomenon in the Ruwenzori range, is the enormous development of its glaciers in the glacial epoch. Of this period we found evident traces before arriving at Bihunga, and still more at Nakitawa. In past ages the valleys of the Mahoma, Mobuku, and Bujuku were filled with glaciers of the first order which united below Nakitawa and descended beyond Bihunga. Again on the western side the Savoia, Elena, and Semper glaciers must have filled the depression between the Stanley, Baker, and Thomson * groups, and probably united with the King Edward glacier. To what point they reached on the western slope I am not in a position to determine, as we were unable to visit that side of the chain.

At present the glaciers are of small extent and all in retreat. This is proved in some glaciers by the existence of recent moraines at a few hundred yards in front of the present ice, and by the freshness of the abrasion of the soil in the neighbourhood of almost all the glaciers.

There are no glaciers of the first order in the principal valleys, but only glaciers of the second order on the upper slopes and in the larger ravines. These are not of the type of simple snowfields, but true glaciers. Unlike our Alps, there are no extensive gathering-grounds, no *névés*, but a series of ice-caps which stretch out in diverse directions glacial fingers. We have in the higher groups of Ruwenzori glacial features which remind us of the Scandinavian type, and have sometimes been described as tropical glaciers. The glaciers that descend lowest are the Mobuku and the Semper, which reach respectively 13,682 and 14,335 feet. The larger glaciers are formed on Mounts Stanley, Speke, Baker, and the eastern side of Gessi. On Mounts Emin and Thomson,* unless there are important glaciers to the north and south which we did not see, the glaciers are of less extent. The permanent snows are included in a circle 10 miles in diameter. On the tops of the range, besides the enormous cornices, we noted a new feature in the huge icy stalactites which seemed to bear up these cornices. The cause of these pillars of ice becomes obvious when one considers the high temperatures often experienced on these summits (sometimes 42° to 44° Fahr.) and the rapid changes in temperature. The highest temperature we had on King Edward Peak was 43° Fahr., and the lowest on the Queen Alexandra Peak 26° Fahr. At Bujongolo the thermometer varied from 50° to 32° Fahr.

Most of our predecessors had found the snow-level at about 13,780 feet, while David and Freshfield, with whom I agree, put it 650 feet higher. This limit corresponds with that to which the glaciers descend on the mountain flanks.

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* See footnote, p. 121.

MOBUKU VALLEY BETWEEN YOLANDA AND BIHUNGA AND PORTAL PEAKS.

BUJUKU VALLEY AND SCOTT ELLIOT PASS.

Rain invariably changed to snow at 14,100 feet. In certain spots in the valleys we observed small levels covered with nothing but grass, plains of lacustrine alluvium caused by stratigraphic conditions, and by barriers of rock more compact than the rest, which anciently barred here and there these valleys, producing above the obstruction a collection of water and special lacustrine deposits, which in time become converted into plains more or less marshy. Lake Bujuku is a good example of a remnant of one of these ancient lacustrine regions.

In the Mobuku and Bujuku valleys, about 10,000 feet, the constantly wet and warm climate produces in especial mosses, Hepaticas, and lichens which cover the faces of the crags and the soil, and conceal the innumerable trunks both of living plants and of those that have fallen from decay. At this elevation the valleys are covered with a luxuriant growth of tree-heaths, laurels, tree-orchids, and ferns, in whose shade grow violets, ranunculuses, geraniums, willow-weed, umbellifera, and thistles.

At about 11,500 feet a number of the plants of the lower region fail, and the trees are limited to the gigantic heaths, Lobelias and Senecios, while the ferns, mosses, Hepaticas, and lichens take the principal place. They reach their greatest development at about 12,000 feet, just before the heaths come to an end. Higher up we find only Senecios, *Lobelia*, and on the ground mosses, Hepaticas, and lichens.

Here the Helichrysums, which had already began to grow at 11,500 feet, form large bushes, and continue up to the glaciers, where with the Senecios they are the highest shrubs.

On the peaks we found a few mosses, lichens, some rare germinaceæ, and a very few dwarf phanerogamous plants, which reminded us of the vegetation characteristic of our Alps. Among the botanical collection made, we have reason to anticipate not a few novelties.

The expedition had not proposed to make special and minute researches into the fauna. Still, as far as the rapidity of the march and the nature of the ground allowed, we collected what animals we could, aided by the effectual help of the Catholic missionaries. As we ascended the Mobuku the fauna became poorer, and above Bujongolo we saw nothing but leopards, bats, moles; very few birds, crows, falcons, and insects and worms. On the peaks we found worms, *Hemoptera*, and *Diptera*.

The collections promise, on first examination, an abundant harvest, not only of species interesting under various aspects, but also of species new to science, particularly among the birds, molluscs, insects, and crustacea.

I have to thank all my companions for the aid they invariably gave me towards the success of the expedition, and to help it to make some modest contribution to science. I have also to thank the English Government and the local authorities of British East Africa and Uganda for the orders given for my benefit and the facilities granted me, which

contributed greatly to the success of our undertaking. By means of the splendid photographs of Sella, the peaks of the Ruwenzori chain will lose their mystery. And these peaks, if they are not the highest in Africa, as some formerly believed, are the culminating points of a range of the greatest importance in the study of the geology and of the glacial phenomena of the African continent.

Before the paper, the PRESIDENT:—

It is customary at these meetings for the President of the Royal Geographical Society to open the proceedings with a brief reference to the lecturer of the evening, and especially with regard to his previous explorations and geographical achievements. To-night that agreeable duty does not devolve upon me, because we are honoured by the presence of the supreme authority of the Society, our august Patron the King. But this very fact imposes upon me another duty; for there are present here to-night an unusually large number of strangers to our Society, as also, doubtless, many Fellows who have joined our ranks during the past few years, and I think they ought to know that, although His Majesty was frequently able to attend these meetings when he was Prince of Wales, during the nearly forty years that he was Vice-Patron of our Society—just as His Royal Highness the Prince of Wales has been Vice-Patron since His Majesty's accession—and although her late Majesty Queen Victoria was Patron of our Society during her long and glorious reign, yet this is the first time that we have ever been honoured by the presence at these meetings of our reigning Sovereign. I should fail in my duty to our Society if I were to omit to give expression to the loyal and deep satisfaction which this unprecedented event will arouse, not only amongst the Fellows present, but amongst that far larger body of Fellows who are scattered over the world-wide empire of King Edward VII. By command of His Majesty, I now invite that most energetic explorer, that born leader of men, that most careful and admirable organizer of expeditions, whether in the temperate regions, or the Arctic regions, or the equatorial regions, our Gold Medallist of 1901, His Royal Highness the Duke of the Abruzzi, to read his paper.

After the paper, HIS MAJESTY KING EDWARD VII.:—

I feel convinced that I am expressing the wishes of the Royal Geographical Society, as well as those of the large assemblage to-night, when we tender our thanks to His Royal Highness the Duke of the Abruzzi for the interesting and exhaustive lecture which he has just given us. He has travelled a long way for this purpose, and it has been, no doubt, a great strain on his voice; but I feel sure that all of us will go home fully impressed with the admirable manner in which this

expedition was fitted out and the successful results which it attained. We have been interested and helped by the lantern slides which have been taken from the photographs of the distinguished Mr. Sella who accompanied the duke on this expedition, and I am sure everything we have seen has brought before us as vividly almost as if we had been with him, the adventures, the successful adventures, he experienced, and his success in surmounting these high peaks of the Ruwenzori. But his Royal Highness is a great traveller and a great explorer. He has done even more than what he has told us to-night. If I refer back to ten years ago, he organized an expedition to attempt the ascent of a still unclimbed peak—that of Kangchenjunga, the second highest mountain in the world. Owing to the outbreak of plague in India, difficulties arose which led him, I believe, to leave Darjiling and turn his attention to Mount St. Elias, in Alaska, over 18,000 feet in height, which he was the first to ascend. In 1899–1900 the duke led an admirably organized expedition in an attempt to reach the north pole. One branch of this expedition attained a latitude 30 miles nearer to the pole than the record established by Dr. Nansen, and not far short of the point which has since been attained by Commander Peary. Our distinguished lecturer is, fortunately for him, a young man, and I hope he has a long life before him in which he will continue to make explorations which are of such value to geography and other sciences. He belongs to an illustrious and distinguished race—I am happy to think, good friends and allies of ours—and, above all things, he possesses great courage, great coolness, and great will. These will, I am sure, carry him through any further expeditions or explorations he may make. I thank him again in the name of us all for his lecture, and I wish him continued success in the course of any future expedition he may undertake.

H.R.H. THE DUKE OF THE ABRUZZI:—

Sire,—I am most deeply moved by the presence of your Majesty at this meeting of the Royal Geographical Society, and by the flattering words just addressed to me. No praise could be more gratifying than this, coming from King Edward VII., from the noble-minded Sovereign of the nation which has always taken the lead in every kind of daring discovery and geographical enterprise, over land and on sea, from the equator to the poles. The hearty reception given to me in this country by your Majesty, your Royal Highness, and the Geographical Society will remain one of the dearest recollections of my life, and will be highly appreciated by all Italians.

THE SEYCHELLES ARCHIPELAGO.*

By J. STANLEY GARDINER, M.A., Fellow of Gonville and Caius College, Cambridge.

THE Seychelles archipelago consists of twenty-nine islands, situated about 575 miles to the north of Madagascar, 1500 miles to the south-west of India, 1725 miles from Aden, and 1100 miles from Zanzibar. With the exceptions of Bird and Dennis, they lie towards the centre of a large bank, included within the 50-fathom line, almost within sight of one another, and are of granitic formation, rising into hills, which vary in height with their size. Mahé is the biggest, covering an area of about 53 square miles, and rising to 2993 feet. Praslin is 27 square miles and 1260 feet high, Silhouette 8 square miles and 2473 feet, and La Digue 4 square miles and 1175 feet. The other more important islands are Frigate,† Curieuse, Félicité, East Sister, and North. These have all extensive plantations with considerable labour settlements, while the rest have, for the most part, one or two families, which make a precarious living by fishing, the collection of birds' eggs, etc. They also scrape up a certain amount of guano from the surface of the granite, and sell it to planters in Mahé and elsewhere. La Digue, Praslin, and Mahé differ from the rest in not being the separate estates of private proprietors, but being divided up between many owners, in fact, in alone having peasant proprietors, who acquired rights originally by squatting on the land. They occupy 84 square miles, and are the most fertile part of the group, so that on their economic condition really depends its prosperity. Bird and Dennis islands differ from the rest in being formed of organically produced limestones, thrown up (or upheaved) on the edge of the bank to the north. Their French names, Île Oiseaux and Île Vaches Marines, show their former peculiarities in being the homes of birds and dugongs. The former have departed, and the latter have been killed off. The best of their guano has been scraped up, and the islands themselves are now being planted with coconuts, the drying of fish being a subsidiary industry. Bird island has a good lighthouse, which marks the passage over the edge of the bank to the north, the channel between the islands being quite free from dangers, 22 miles broad, with over 30 fathoms of water.

The group was under Mauritius until 1903, when it was separated and made a distinct Crown colony. It was then given as dependencies, the Amirantes, Desroches, Platte, Alphonse, Providence, St. Pierre, Astove, Cosmoledo, Aldabra, and Assumption, the last two being about

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* Read at the Royal Geographical Society, November 12, 1906. Map, p. 248. This paper deals with the Seychelles in other aspects to the same author's paper in the *Geographical Journal*, October and November, 1906, pp. 313–332 and 454–471.

† This island lies to the south-east of the group, and is not included in the large chart at the end of this number.

80 miles to the west of Cosmoledo and Astove. These are all separate islands or island groups, with the exception of the Amirantes, which includes six inhabited islands—Marie Louise, Poivre, Darros, St. Joseph, Eagle, and African. Thus, in the division, there were included with the Seychelles all the islands towards Madagascar, with the exceptions of Coetivy and Farquhar, which remained attached to Mauritius on account of their proprietors belonging to that island. The former is an outlying island of the Seychelles archipelago, being only 130 miles from Mahé, and Farquhar is almost on the track to Cosmoledo and Astove. Both recruit their labour in the Seychelles, and ultimately must be transferred to its government. A further advantage in such a change would lie in

VIEW FROM CHATEAU MARGOT, LOOKING NORTH ALONG THE RIDGE OF MAHÉ, WITH MORNE SEYCHELLOIS AND TROIS FRÈRES.

the fact that the Seychelles is out of the hurricane zone, whereas their present headquarters is almost in its worst belt. For similar geographical reasons, the Chagos archipelago sooner or later must be attached to the greater land masses either to the north or to the west, to Ceylon or to the Seychelles. Winds, currents, and distances favour the latter, as well as the negro character of its labour. Finally, if one may prophesy, in the process of consolidation which is going on everywhere, East Africa will claim sway over the Seychelles, probably greatly to the advantage of both colonies.

The Seychelles may be considered almost unique, in the fact that it has no human history, in that it possessed no regular inhabitants before the advent of Western peoples. It may have been known to

early Arab traders, but it is altogether unlikely that its existence can ever have been a matter of common knowledge to their navigators. To the Malays it would have been too far south for any wind or current to have shown them of its existence; while, if known to the Arabs, we must conclude that its inhospitable waterless islets and reefs towards Madagascar caused a shunning of the whole of its region and a course right along the African littoral. Yet, the absence of indigenous inhabitants from Mauritius, Chagos, Bourbon, Rodriguez, and Seychelles, not to mention a host of small islets and groups, is an extraordinary fact as compared with the vigorous and dense populations which at some time or other dwelt on nearly every islet in the Pacific ocean.

The first white discoverers of islands in the vicinity were undoubtedly Portuguese navigators, at some period towards the end of the fifteenth century. The Cape of Good Hope was rounded in 1487, and M. A. A. Fauvel has shown that the group first appears on the charts of Alberto Cantino and Nicolas Caneirio in 1502. It is better represented in one of 1520, in which most of the island groups to the north of Madagascar are clearly shown. It suffices to say that it appears on eighteen charts of the sixteenth century. The islands were evidently well known, and must often have been sighted; but it is an extraordinary fact that we have, in the first two and a half centuries after their discovery, only one record of any visit.*

Silhouette was sighted by one John Jourdain (who left a journal) on January 19, 1609.† The skiff was on the following day sent off to North island; "butt because our men made noe signe of any water we ankored not. Soe the boate retourned and brought soe many land tortells as they could well carrie. Soe we stoode alonge towards the other islands. The tortells were good meate, as good as fresh beefe, but after two or three meales our men would not eate them, because they did looke soe uglie before they weare boyled; and soe greate that eight of them did almost lade our skiffe." Praslin, Mamelle, and other islands were seen, but finally they came to anchor at Port Victoria on January 21, remaining there until the 30th, while they watered and obtained firewood. In particular, Mahé is stated to have had much large and "very firme timber." . . . "It is a very good refreshing place for wood, water, coker nutts, fish, and fowle, without any feare or danger, except the allagartes; for you cannot discerne that ever any people had bene there before us." Jourdain's shipmates, Jones and Revett, recommend the group for refreshing ships' crews, etc. Both

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* *Vide* "L'Archipel des Seychelles; Étude de Cartographie," *Revue Française de l'Étranger*, etc., t. 17, p. 433, 1893. Also "La Découvertes des îles Seychelles d'après des Documents inédits," *La Géographie, Bulletin de la Société de Géographie*, t. 1, p. 289, 1900, by the same author.

† The *Journal of John Jourdain*. Edited by Wm. Foster, and issued by the Hakluyt Society. Pp. 46–50, 349–350 1905.

refer to the large number of almost tame doves, but neither to the crocodiles. Revett mentions "land turtles of so huge a bidgnes which men will thinke incredible; of which our company had small lust to eate of, beinge such huge defourmed creatures and footed with five clawes lyke a beare."

The next visit was that of Captain Lazare Picault's expedition in 1742, later by 133 years. It may be supposed that this neglect of these lands was due to the fact that they were uninhabited, and therefore had no trade, the chief object of early navigators. The land appeared rocky and inhospitable, the anchorages and approaches bristling with dangers,

DOUBLE COCONUT TREES IN THE VALLEY OF THE COCO DE MER PRASLIN, REPUTED TO VARY UP TO 800 YEARS OLD.

the vegetation entirely new, and therefore worthless. Perhaps the piracy that flourished around Madagascar caused an avoidance of these seas. There are also legends in the Seychelles, among the older Mauritian families, of the group having been the headquarters of many adventurers. These do not, as far as I could ascertain, rest on any basis of historical fact, but there are possibly on Praslin and Frigate * the remains of pre-European structures. The tradition is that there was, in Praslin, a pirate settlement and station for repairs, and that one of the

* Mr. Connor, the owner of Frigate island, examined it at our request, and found the remains of a stone erection. He also states that within the reef there is a basin with a passage to the same, that might have been used for repairs.

bays on the north side, Côte d'Or or Curieuse, was used for this purpose.* Certain works, which might have been of the nature of forts, and supposed artificialities in boat channels were pointed out to us, but they did not seem capable of being dated.†

As general evidence of their statements, the people of Praslin point to the burnt stumps of massive trees, mostly gayac (*Afzelia bijuga*) and takamaka (*Calophyllum inophyllum*), and to marks of fire on the double coconut, or coco-de-mer (*Lodoicea sechellarum*), which is confined to that and the neighbouring island of Curieuse. The former cannot be dated, but, taking known rates of growth of the latter, we have some evidence of fires at least two hundred years ago. Many of the older coco-de-mer are scarred at their bases, as if by fire, but the trees relied on show a ring at about 10 feet above the ground. This is stated to have been formed by the burning of the dead stems of the leaves below the living crown of the palm, which was not killed. Five trees were strikingly similar in height above this ring, but the supposed age of their new growth may be quite erroneous. Together with the burnt stumps, etc., they, in any case, give evidence of great forest fires extending all over Praslin, and causing devastation which must have profoundly modified both its fauna and flora, quite sufficient to account for its scantiness as compared to those of Mahé and Silhouette, on which there is no evidence of such conflagrations.

The two journals, which still exist, of Captains Grossin and Picault's expedition are interesting as showing the existence in Mahé of land tortoises, which are clearly distinguished from "tortues de mer," the latter being noted as all of the valuable shelled variety, *i.e.* "carets" (*Chelone imbricata*). Revisiting the group in 1744, Captain Picault formally annexed the large island, calling it Mahé, and the group "Les Iles de la Bourdonnais," both after the then governor of Mauritius, Mahé de la Bourdonnais. He also prepared the first chart, which comprised thirty-three islets, etc. The annexation was completed in 1756, when the name was changed to "Sechelles," after Moreau de Séchelles, Contrôleur des Finances, 1754–6. Careful charts were made of Port Victoria, then called "Port Royal." Frigate island, termed "Ile Annonciation," was at that time discovered. In 1768 Praslin was formally annexed by

* Where a legend is universally spread, experience leads us to believe that it rests on a basis of truth. We therefore mention it in the hope that further references may be discovered to the Seychelles, when fresh journals of voyages in the Indian ocean come to light, as recently has that of John Jourdain.

† We were lent, by Mr. Bouton, of Côte d'Or, Praslin, a curious pamphlet entitled 'Histoire et Description des Îles Seychelles,' par Charles Anastas (Maurice, 1897), which gives most circumstantial details of the early history of the group. Unfortunately, he does not mention his authorities, whose views and statements, we think, must be as yet unpublished. Of the European pirates, who followed the Arabs, he mentions the names of Boynot, Taylor Coudent, Egland, and Olivier le Tasseur (La Buze).

M. Duchemin and M. Lemperière, the neighbouring islands of La Digue and Curieuse receiving names from their vessels.

In 1769 a further expedition, under M. du Roslan, visited the group. The Abbé Rochon, who was on board, fixed the position of Mahé, and remarks * that the "Secheyles and the adjacent isles were inhabited only by monstrous crocodiles; but a small establishment has been since formed in it for the cultivation of nutmegs and cloves. In one of these islands, called the Isle of Palms (Praslin), there is found a

VIEW ALONG NORTH SIDE OF TROIS FRERES. WATER-WORN CLIFFS, WITH *PANDANUS HORNEI* IN FRONT, DEAD CAPUCIN (*NORTHEA SECHELLARUM*) BEHIND, AND JUNGLE LARGELY FORMED BY CINNAMON.

tree which bears that celebrated fruit known by the name of the cocoa of the Maldives, or 'coco-de-mer.'" It was in the course of this expedition that the Amirante group was traversed, and its separate islets named. Silhouette was, so far as we know, for the first time visited, and was remarked upon for its richness and the large number of crocodiles and sharks around its coast. La Digue would also appear to have been

* English edition, 1792, p. lii.

examined by Charles Oger,* one of the officers of the same expedition, who is said to have captured a crocodile (caiman) 30 feet long by 8 feet round, and to have found also "une couleuvre capelle d'une grosseur extraordinaire."

A settlement was formally established about the same time for the cultivation of spices, and regularly visited. In 1773 Dennis island was discovered and described as "généralement couverte de tortues de terre et de mer, de vaches marines et d'oiseaux." It was covered by soft-wooded trees (probably the tanghain and mapou, as now is S. Pierre, Providence), in which were vast numbers of birds, which no doubt formed the guano, up till recently being regularly worked. The *Eagle*, of Bombay, on a voyage for coco-de-mer, is said to have set fire to Curieuse, and certainly visited Bird island, where the large number of sirenians and birds was noted. Platte and Coetivy islands, which do not actually stand on the Seychelles bank, were discovered in 1769 and 1788 respectively.

Most of the larger islands appear to have speedily become more or less populated from Mauritius, in 1777 there being twelve families of slaves even on La Digue, cultivating cotton and coco oil. The islands were captured in 1794 by Captain Newcome, H.M.S *Orpheus*, and again in 1805 by Captain Ferrier, H.M.S. *Albion*, being finally ceded in 1814 to England, M. Le Queau de Quinssy, who had served the King, the Republic, the Empire, the latter alternating with the English Government (when H.M.'s ships were visiting the islands), still continuing to administer them. They were at that time placed under the government of Mauritius, and continued to be so until 1903, as already mentioned.†

The present population of the Seychelles, which numbers about 21,000, has been made up of French and Anglo-Saxon elements, with blacks of different sorts from India, Madagascar, and every part of Africa; a few Chinese shopkeepers are recent immigrants. Up to about 1825 its constitution was practically the same as that of Mauritius, and its aristocracy was simply formed of the descendants of younger branches of Mauritian families. In the "society" of the islands at the present day are found such of these as have continued to keep their families untarnished—there are remarkably few that have done so—together with the pure-blooded descendants of such English officials and planters as have settled on the islands since their annexation. It is in every way a charming society, but its tone of thought, its pride (owing to poverty) amounting almost to exclusiveness, and its lack of energy, is such that to it the English are scarcely admissible, and that it is of little value to the country as a whole. Its position would be

* *Vide* Charles Anastas, *loc. cit.*

† M. de Quinssy was buried in Government House garden, Mahé, where his tomb still stands.

better understood by reference to the land laws; but one may say in passing that, owing to the spread of education, it shows signs of an awakening, which, if encouraged, may well make its children of great use, not only to the colony itself, but also in the development of East Africa as well.

The coloured classes, with the exception of the few Chinese traders, consist, firstly, of the descendants of slaves, introduced from Mauritius. These would appear to have been mainly negroes from Madagascar and

MANGROVES OF THE COAST (*CERIOPS CANDOLLEANA*, WITH *RHIZOPHORA* IN FRONT AND *BRUGIERA* TO THE RIGHT).

the Cape. There were, however, some Indians among them, and from time to time additional ones have been introduced for domestic service, etc., themselves or their descendants drifting finally on to the land. Altogether the Indians can scarcely have ever numbered more than a few hundred, but they made a considerable impress on the race, one not always distinguishable from that of white races, this complicated by the fact that they were of saving propensities, and bought or cleared stretches of land. Lastly, there were in the middle and the second half of the last

century, negroes introduced from captured slave dhows, brought together by raiders from every part of Africa to be sold in Arabia and Persia. The exact number of these it is difficult to estimate, but it is supposed that there cannot have been less than 5000, mostly males. Many of these, and some also of the negroes on their release from slavery on the plantations, took to the high lands and jungles of the larger islands. They cleared patches of the forest, and planted bananas, yams, and other vegetables. Most isolated themselves as much as possible, and it is not uncommon to find in such jungles as remain patches cleared by them. The descendants of a few still retain their lands, but most have been ejected, or bought out, owing to their propensities for thieving and elevating liquors.

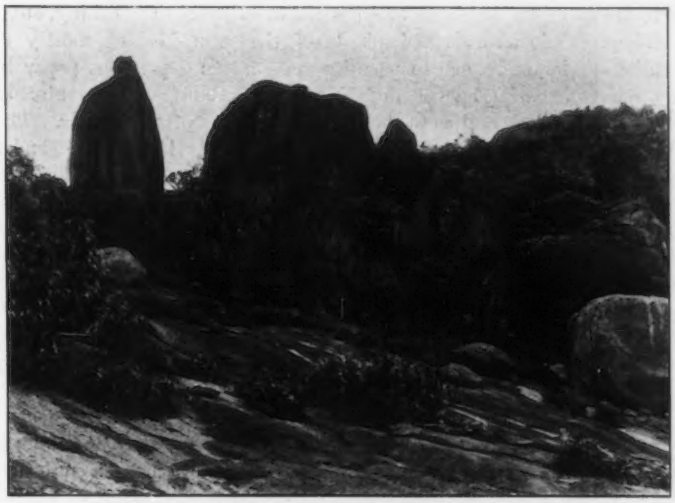
The black inhabitants now divide themselves into four classes—those who own land, separated further into those who have and those who have not Western blood, and those who have no land, "enfants des îles," and foreigners. There are a very considerable number of the first subdivision, owing to the Code Napoleon being the law of the country, whereby illegitimate children, if recognized (even when of considerable age) by their male parent, are entitled on his death to shares in his property. The second class of landowners are mainly descendants of Indians, with a few negroes. Most of the "enfants des îles" are of negro or mixed negro and Indian origin, while the foreigners are mostly negro slaves from captured slave dhows, often with characteristic tribal marks. These latter sections form the plantation population, but they differ in that the "enfants des îles" settle down in one place, whereas the negroes are always changing masters, taking any new job that offers for the sake of variety. The former have generally received some sort of education in childhood, but the latter are quite ignorant. They make, though, the best labour, being in every way more honest and truthful, though requiring to be employed in piece-work.*

All the people are nominally Christians, about half belonging to the Roman Catholic Church, which has a bishop with numerous schools and establishments in the group. Of the remainder about half profess the English Church, and the other half whatever Church their questioner is supposed to belong to. About a third of the births are illegitimate. Education is mainly in the hands of the clergy, supported by grants from the Government. Its standard is very low, but there is an undenominational Government High School at Port Victoria, which is gradually improving its tone throughout the islands. The chief food of the people is rice, which used to be grown very extensively in the marshes, previous to the introduction of the beautiful though graminivorous cardinal bird; it is now entirely imported. Cassava, yams, and bananas are the chief food of the landed peasants, together with fish,

* There is an abundance of labour of both kinds. Pay varies from Rs.8 to Rs.15 per month, food included, as well as all extras.

fowls, and a little turtle and pork, the latter fattened on the pooniac left after the oil has been extracted from the coconut. Flying foxes (*Pteropus edwardsi*) are also eaten, and very occasionally tenrec, which, introduced for the blacks about forty years ago, are now a considerable pest.

The Seychelles is almost ideal as a sanatorium for nearly all tropical and other diseases, with the exception of phthisis. The south-east monsoon blows from May until October, and the west-north-west from December to March, November and April being months of variable winds. The south-east is the dry monsoon. Hurricanes are almost unknown. The average rainfall at sea-level is 100·8 inches for the last fifteen years, at 250 feet about 110 inches, and at Cascade, Mahé, 600



THE STORM-SWEPT SUMMIT OF MOUNT SEBERT, 1600 FEET. DWARFED TREES, WITH *PANDANUS MULTISPICATUS* TO LEFT.

feet 123 inches (H.P. Thomasset, nine years), while in the mountains over 2000 feet, it must exceed 150 inches; the summit of Mount Seychellois, 2993 feet, is daily covered in mist. The average monthly rainfall in the dry season, even in the mountains, does not appear to exceed 6 inches, and, as it falls mainly at night, does no more than cool the air. The temperature at the coast varies from 67° to 90° Fahr., but in the mountains frequently falls to 55° or 60° at night.

The birth-rate of the group averages 34·4, and the death-rate 17·74 (ten years). There are no fevers, nor malaria, nor, indeed, any of the regular tropical diseases. Forty per cent. of the deaths seem to be due to old age, and a second forty per cent. to the lack of knowledge among

negro mothers of the proper methods of rearing infants. There is an abundant supply of excellent water, and diseases spread by it are almost unknown. Practically all the people are vaccinated, owing to their experience of small-pox epidemics in the past. Plague is unknown. Curieuse was formerly a leper island, but the present settlement, with its average of about a dozen inmates, is on Round island off Praslin; the disease seems to be in process of being eliminated. There are several spots at 1000 to 1500 feet on the ridge, and overlooking both coasts of Mahé, which would make ideal sanatoria in the dry season, their temperatures not exceeding moderate summer heat in England, the sun always tempered by healthy breezes from the sea. With comparative ease sufficient land could be levelled for tennis, croquet, and other outdoor games; while an hour's ride would serve to reach Port Victoria, where there are excellent facilities for cricket, football, yachting, fishing, etc.

The endemic animals and plants of the group belong mostly to peculiar species, and some to peculiar genera. In a previous paper in this same *Journal* (October and November, 1906), I have already referred to both, as well as to the physical features of the islands. The fauna will be the subject of a series of separate reports elsewhere, and I would only here emphasize the former existence in the group of dugong, land tortoises, and crocodiles. There is little of the indigenous jungle left, and we only found traces of the real invertebrate fauna. It was probably as peculiar as the flora, and may best be compared to that of the Sandwich islands. The most expert and longest-continued collecting would probably now scarcely reveal a quarter of the variety of animal life which the group possessed when it was discovered. We obtained our collections mainly from Mahé and Praslin, but we hope subsequently to visit Silhouette, where a considerable stretch of jungle still remains.

The jungle, as it formerly extended over the whole land, might have apparently been divided into two zones, one of which was capable of much further subdivision. First, there was the great distinction into the jungle of lands rich in lime, and that of lands consisting of almost pure granite. The former was for the most part found on flats near the sea, formed by elevation, or else sedimentary deposits from the streams aided by material thrown up by the waves (foraminifera, shells, fragments of coral, and calcareous seaweeds). Against the sea this land was, of course, excessively salt, but further in quite fresh, often with freshwater pools. Most of this area has now been cleared and planted with coconuts, but on Curieuse and behind small bays elsewhere some indications of its flora are yet distinguishable. Immediately against the sea, especially near where any swampy land occurred, were mangroves of the same species as are found in East Africa and all round the Indian ocean. Elsewhere against the sea were large trees of *Calophyllum* and *Barringtonia*, with bushes of *Pemphis*, *Scævola*, *Pandanus*, and *Tournefortia*. Behind these appeared a few large trees, banyans (*Ficus*), *Afzelia*,

Pisonia, and *Hernandia*, with shrubs of *Hibiscus*, *Antirrhœa*, *Ochrosia*, etc. Another denizen may, or may not, have been the coconut; we learn from Jourdain's and Picault's visits that there were plenty of its trees near the coasts, but it is doubtful whether they were not originally introduced.* Individual plants, mangroves, banyans, etc., may show special characters of adaptation. Many, indeed, have a marked increase in the coriaceous nature of their leaves in accordance with their proxi-

ON CASCADE AT 1400 FEET. BASE OF *WORMIA FERRUGINEA*, WITH SPREADING ROOTS.

mity to the sea; but it can scarcely be said that this flora has any particular characteristics, save absence of palms, climbers, ferns, mosses, and conspicuous grasses. Its general appearance is almost that of a luxuriant temperate dicotyledonous forest in full leaf, and its interest lies in the fact that the very large majority of its plants are the same species as one finds on any of the purely oceanic coral islands of the western Indian ocean.

* The coconut is known to have been introduced into nine-tenths of the dependencies of the Seychelles, and if it reached the latter by currents, etc., it is difficult to understand how it failed to reach them.

Very far different to the last is the granite forest, which, in its general characteristics, is almost typically that of a tropical moist district. Little of it now remains in Mahé, merely patches here and there, with larger areas on Morne Seychellois and the slopes of Mount Harrison, the whole scarcely more than 3 square miles in all. In Praslin there are only a few peaks, and they are now nearly all covered with palms, dicotyledonous trees having been almost entirely rooted out. Silhouette is much better, having almost a square mile in its centre, within which alone the bois de fer (*Stadtmannia siderozylon*) and the bois de natte (*Maba seychellarum*) still flourish. In striking contrast to our first type of forest, nearly all its trees, shrubs, and herbaceous plants belong to species, and many to genera, peculiar to the group. The coco-de-mer is confined to Praslin—it was probably introduced by man to Curieuse—and there are certain trees, too, found only in Mahé. It would seem to be an eminently successful flora, admirably adapted in every way to the conditions of the region; but it is not one capable of withstanding such introduced plants as the cinnamon and casuarina trees, the jamrose and the bamboo. Its most important tree was the capucin (*Northea seychellarum*), the massive dead stems of which form a conspicuous feature in its landscape. It fell a prey to a green beetle (a species of *Cratopus*), probably introduced from Mauritius, which lays its eggs in its buds, the centres of which its larvæ subsequently eat out.

Any full account of the jungle would be a mere catalogue of trees, to each of which one might add notes on its special adaptation to its environment. More broadly, one might point here to a marsh with its peculiar grasses, there to a valley of the most luxuriant growths. The crown of the hill above is perchance almost bare of soil, such as the top of Mount Sebert, physiologically dry, with stunted coriaceous trees and a few succulents; or is perchance in a region of almost perpetual mist and cold, its trees, for other reasons, dwarfed and all festooned with moss.

Imagine Cascade extending behind into the endemic jungle of Mount Harrison. It is an amphitheatre opening from a gorge extending up 600 feet from the sea and spreading out into a circlet of hills, each with an almost perpendicular face, but each at some point throwing out an earth-covered buttress, either completely planted with vanilla or covered with the bracken-like *Davallia*. Between these are flat valleys, broadening in places into marshes, each with its stream. Ascending along one of the latter, we lose it in a mass of large boulders and rocks, and we find ourselves in a cañon with almost perpendicular sides, from which we see no egress save by the way we came. Yet we can surmount it almost anywhere, dodging rocks, clinging on to and climbing up the roots of a *Pandanus seychellarum*, or holding on to some liane. Practically perpendicular, it is at the same time nearly all covered with

forest. Looking at its face, we see the white trunks of trees, and, hanging down everywhere, their roots. Every crevice has its tree, and every fissure its ferns. This little flat has a *Pandanus* (screw pine), with its roots in a great cluster searching, perchance, a hundred feet below for some place to affix themselves. That one has a *Wormia*, with its broad base a mass of great roots; while its neighbour has a capucin, perhaps one branch still alive, depending on its great buttresses against the wind. Here is a bois montagne (*Uapaca griffithii*), and there a

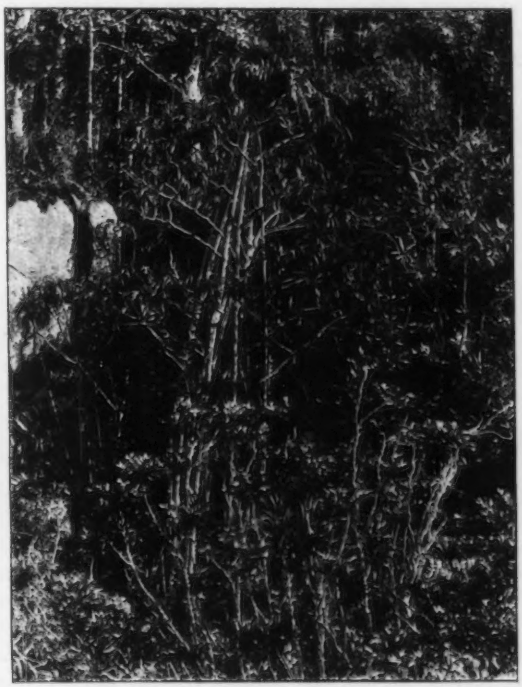
JUNGLE ON MORNE SEYCHELLOIS, 2500 FEET. *VERSCHAFFELTIA SPLENDIDA*, WITH STILT-LIKE ROOTS, AND *ROSCHERIA MELANOCHÆTES* (PALMS), WITH SHRUBS, YOUNG TREE-FERNS, ETC., ALL PECULIAR SPECIES.

banyan, originally grown over a sandal tree (*Carissa sechellensis*), but now sending its roots, almost like immense lianes, over, down, and around the rock below. Wherever the seeds of palms may rest, they grow: the robust latte (*Verschaffeltia splendida*), with its wilderness of small stems, adventitious roots, and the *Deckenia*, beloved for its nuts and palmiste (salad made from its terminal bud).

Our toil reaches its reward at last at the summit of the ridge, where there is an irregular plateau with valleys and glens, flats within the cloud-line, and marshes the origin of many streams. All the typical jungle trees are present in amazing wealth and confusion: palms, dead capucins, but especially *Pandanus hornei*, single stemmed in the deep-soiled marshes, but arising on a mass of stilt-like roots on the rocky hills. Beneath the latter nothing lives, a mere forest of dead leaves, but elsewhere in the glens tree-ferns up to 10 feet in height make themselves conspicuous—their destruction in the last few years of drought has been appalling—covering over their smaller brethren of many kinds. A rock here is covered by a giant hart's-tongue (*Asplenium*), while a *Lycopodium* hangs down and hides one face, a *Selaginella* another. The tree-stems are covered with moss in pendent festoons, perhaps pushing out of which are the fronds of a climbing fern, while irregularities give support to many other species. Orchids are scarce and mostly inconspicuous; but on fallen capucins and on horizontal boughs, the *Roscheria* palm and various shrubs have taken up their abodes, their roots seeking the ground below. Pushing up in among the ground ferns we see clumps of *Curculigo seychellensis*, looking like beds of palm seedlings, their flat leaves coming up in bunches and forming a most conspicuous constituent of the undergrowth. The large leaves, too, of the aroid (*Protarum seychellarum*) do not allow themselves to be forgotten, while there is a wealth of growth of the seedlings of all the plants overhead, few to survive the struggle. To cloud and mist all the trees are admirably suited; a dankness and darkness that almost might be felt would appear to be their natural environment, but yet all show adaptations against the variability of nature as seen in her two seasons, wet and dry. The screw pines, palms, and ferns all direct the falling showers to their stems and roots, while the dicotyledons are all thick-leaved and capable of holding their own in drought or wet. *Wormia* admirably looks after itself; the leaves of its trees above are thick, coriaceous, and hairy, 8 to 10 inches long, while those of its seedlings below are thin and smooth, some 3 feet in length. The latter surround their weakly stems with sheaths, adaptation from stipules, natural cups of water, which keep moist the young buds of the lateral branches and the terminal shoot. Many other plants show still more remarkable adaptations, but we cannot here attempt to do justice to the scientific interest of the jungle plants any more than to the extraordinary, perchance rather sombre beauty of the jungle as a whole. As compared with Ceylon, it lacks its wonderful lianes, but gains tenfold by the wealth and luxuriance of its palms and undergrowth.

Leaving the forest, we naturally turn to a once important industry—timber, with shipbuilding. It is difficult to ascertain how far timber was exported, but in many houses in Mauritius we saw Seychelles woods, and we were also informed of shipments to India and Zanzibar.

The bois de natte, bois gayac, and the bois de fer give beautifully grained and most durable woods, and were, together with the capucin, the principal trees felled for timber. The jungle is a mixture of all sorts of trees, and there are no woods formed almost entirely of a single kind of tree as in temperate regions. Each tree had to be sought after, and the first three trees mentioned are now almost extinct, though many fallen trunks in Silhouette, never yet carried, bear evidence to their former abundance. From 1810 to 1840 there were forty-seven vessels of 24 to 420 tons built in the Seychelles, and they probably scarcely



ON MOUNT SEBERT, 1400 FEET. CLIFF COVERED WITH VEGETATION. IN THE CENTRE *PANDANUS SEYCHELLARUM*, WITH ADVENTITIOUS ROOTS 70 TO 80 FEET LONG.

form more than a third of the total number. A large number of vessels used to put in for repairs, but the whole shipbuilding industry is now extinct. The gayac gives an excellent example of how a species of tree can be practically extinguished in a locality, so that a botanist can scarce be certain that it ever really existed. It was distributed from Malay to Madagascar, flourishing equally well on siliceous and calcareous soils. Its old timber, of a rich red colour, is resistant to white ants, and

therefore sought after for house-building. It was also employed almost exclusively for the keels and principal timbers of the ships. Its smaller boards and trees were used for boats, or the canoe-like pirogues of the region, while its young growths were sought after for the handles of fish-spears. On Salomon atoll, in the Chagos, its trees covered nearly every patch of land, while it was certainly common all over Praslin. Now it is practically restricted to one islet of the former, where it is carefully preserved, and we sought for some weeks in Praslin and Mahé without finding a single tree growing wild; indeed, our own observations alone are not sufficient for us to speak of it as an endemic tree of the group.

The Seychelles have no mineral wealth, and hence depend entirely upon agriculture and fish. At first they were planted with spices—a secret establishment to cut the trade with the Far East; but these were all destroyed by fire on the arrival of a ship flying English colours, which turned out to be French. They were subsequently replanted, and exports up to 1850 consisted mainly of cotton, cloves, cinnamon, nutmegs, coffee, tobacco, maize, rice, coconut oil, timber, fish and fish-oil, sugar, and tortoise-shell. At the same time, and for many years subsequently, the neighbouring seas were the scene of an important sperm fishery, mainly pursued by American and French whalers. On cotton being superseded, a variety of products were tried, until finally vanilla was introduced. This succeeded beyond the wildest anticipations, until in 1899, out of a total export of £140,000 over £100,000 was vanilla. The jungle was at once cleared everywhere, and its vines were planted. Sometimes a whole hillside was cleared, sometimes stumps were left for supports, and sometimes the larger trees for shade. Each method at first seemed fairly successful, and good crops were secured. The plant itself is an orchid, and the seed-pods form the bean of commerce. As there is no suitable insect, fertilization has to be done by hand. Each bean is stamped with its owner's mark while still green, and the beans, when they begin to ripen, are picked, killed in boiling water, and dried in hot air. They are then sorted, put up in bundles of sixty, and sent to the European market, most going to France. Great care has to be taken in killing, drying off, and sorting, and the lack of this among native planters to some small degree accounted for the greater falling in price of the Seychelles product as compared with that of other localities. The fall in the price of all vanilla, in the Seychelles from Rs.33 per kilo in 1900 to less than Rs.6 in 1905, was another matter, and was due both to competition with the Comoros, East Africa, Mexico, Java, and other places, and to the isolation of vanillin from cloves, this being the main flavouring constituent of the vanilla. At Rs.6 per kilo vanilla just pays for growing, and the price might be slightly increased by the whole curing being concentrated in a limited number of hands. The present distress is, however, also due to a failure of crop. There may

at any time be a reaction against vanillin, an event which would once more make the growing of vanilla highly profitable, but meantime it is necessary to try and find some other product. *En passant*, however, one may point out that much of the cultivation of the vanilla is very rough, that vanilla is an orchid requiring vegetable humus and limited light, and that some of the failure in yield may be due to excessive clearing of the overgrowth and cleaning of the soil.

In any agricultural country a percentage of the profit should be put aside for the improvement of methods of cultivation, and of the stock (or plants), and also for ascertaining what other and secondary products may be grown with advantage. To the fact that this has never been

REED-COVERED MARSH, WITH *PANDANUS HORNEI*, SINGLE-STEMMED IN ITS DEEP SOIL.

done in the Seychelles until the last two or three years, that colony owes its almost continual waves of prosperity alternating with waves of great depression. Of course, these can never be entirely avoided in any agricultural community, but the establishment of botanic and economic departments in most tropical countries has ensured that the hollows of the waves shall be considerably lessened in depth. The botanic department, under Mr. Dupont, has now found a substitute for vanilla in Para rubber, *Hevea brasiliensis*, which promises to yield, if somewhat less profitable, certainly more durable results than vanilla. The rainfall and soil are not dissimilar to the parts of Ceylon and the East Indies where it is known to flourish. Much of the land at present in vanilla appears suitable, and all conditions seem favourable. Lastly,

there are now enough trees scattered all over Mahé and Praslin to prove, by their luxuriant growth even on relatively steep slopes and scanty soil, that it is eminently a product suitable to the country. Of course, it takes five or six years to establish, and even the grade of the milk is uncertain, but its commercial success would seem assured.

The most permanent and reliable export of the Seychelles has been that of coconut products. The nut, after drying, is still placed in similar old mills to those used fifty or more years ago, and worked by cattle, donkeys, or ponies. The oil extracted is either used or exported as such, or made into soap, the carbonate of soda for which may be made (and is commonly made in the outlying islands for local purposes) by burning the husks of the nuts. A few coconuts are also exported, and in the last few years a certain amount of the dry kernel of the nuts, copra, has been sent to Europe. Many of the flats, rich in lime, have been placed into coconuts, and they are the chief product of the dependencies of the Seychelles. On some of the granite hills, up to 800 feet, they grow well, especially where not too far from the sea; their average yield, though, while thoroughly profitable, would scarcely seem to be more than a quarter of that on coral islands. The value of coconut products exported in 1905 was about £28,000, but this amount might easily be increased at least threefold by increased and better cultivation.*

Of other agricultural products of the group it is not necessary to say much. If Para rubber is developed successfully, their future will depend upon how far they can be grown under its trees, or on slopes unsuitable to it, or for the employment of labour during slack seasons. Cocoa grows well in the mountains, and at one time promised to be very successful. It was nearly dropped for vanilla, but will probably be revived with improved methods of cultivation. Liberian coffee yields bountifully, but gives no profit; its use is largely prevented by the fact that its beans require seasoning for at least a year before being roasted. Clove trees produce a good crop about every fifth year, and grow well. Pepper is only grown for home consumption, as also are tobacco and small quantities of various other spices. Sugar-cane is only planted by the natives, principally for the purpose of producing an intoxicating beer, known as "bacca."† All kinds of bananas yield well, and may

* A conservative estimate shows that at least 13 per cent. of the oil is not extracted by the primitive mills employed. The ground under the trees is dirty, and the trees themselves are planted too close for the best total yield per acre. Many of the trees are much bored by beetles, but this can easily be cured by cleaner cultivation and by preventing the natives from cutting the trees with the large knife, like a machete, which is commonly carried. The nut grown is a small variety, and might be profitably replaced by the Ceylon nut. Lastly, the area might be greatly increased in the Seychelles, and more than doubled in its dependencies.

† The collection of "kalou" (coconut sap), and the fermenting of the same, is prohibited. Owing to the present depression, "bacca," much to the detriment of the revenue, has largely replaced the strong red Provence wine and the Mauritian rum that used to be drunk by the natives. The regulation of its fermentation is one of the chief troubles of the police.

subsequently be developed for banana flour, or preservation for cooking purposes. The export of pineapples to Egypt, etc., is suggested, and of other new products possibly valuable in the future we may mention cardamoms, camphor, sandal-wood, and mangrove bark. Fibre has been tried, and proved unremunerative.

Among natural products of such an island colony we may mention guano, the export of which may be increased in the immediate future, though it must ultimately cease. Tortoise (*i.e.* turtle) shell is important, but keeps up solely because it is only in the last few years that serious attempts have been made to commence the development of the southern dependencies of the colony. If the present ruthless destruction of these

A TYPICAL MILL OF THE BEST CLASS USED FOR EXPRESSING COCONUT OIL. COCONUT MILL ON THE ILE DU COIN.

turtles is continued the supply will cease, but probably the young could be penned off and profitably grown in many of the atoll lagoons. The latter, too, are in many cases studded with shell-oysters, the cultivation of which, as well as that of sponges, is only a matter of time. Lastly, we may refer to the export of calipee, the gelatinous shell of the edible turtle, and to that of dried fish, the latter capable of some development, though wholesale methods, such as by trawling and drift nets, are not likely to be successful.

Examined in respect to the natural sciences, the Seychelles group must always be regarded as possessing extraordinary interest. Granite is essentially a continental rock, and its islands form the most isolated masses of such rock in the whole world. Its fauna and flora are of

immense importance to the students of evolution and of geographical distribution. To the pure geologist, who attempts to trace the topographical history of the world in past ages, it must be considered as a possible link between Africa, or Madagascar, and India; while to the oceanographer, who is concerned with the ever-continued fight between land and sea, it presents innumerable problems. To the historian's mind it must bring an entrancing tale of daring struggle; while for the anthropologist it almost appears to be developing in its "enfants des îles" a new race of mankind with a peculiar tongue, the Creole, on a French basis with Indian, negro, and English words. Its beauty caused it to be termed by General Gordon the "Garden of Eden," while its healthiness must ultimately make it a sanatorium for neighbouring continents. Like all island groups, its economic condition fluctuates, and it is at present depressed, but even now there are signs that its curve may rise higher than before. To us, as a seafaring race, an island group, developing a hardy race of sailors, may at any time be a possession of inestimable value, and strategically Port Victoria is an excellent harbour, the possession of which is obviously of enormous importance to the whole empire.

In conclusion, we would desire to express our indebtedness to his Excellency the Governor of the Seychelles, W. E. Davidson, Esq., for his keen interest in all that affected our scientific investigations, and for much personal kindness—his reports for 1904 and 1905 will repay investigation, and have been used by us without specific acknowledgment; to Mr. H. P. Thomasset, a most accomplished naturalist and the chief English planter in the Seychelles, for his continual aid in many ways; to Mr. R. Dupont, the vigorous director of the Botanic or Economic Station, who freely showed us his numerous experiments, and who gave us most valuable information on the geology and botany of the group; to M. de Gaye, M. Bouton, Mr. Connor, Mr. Griffiths, and a host of others whose suggestions and advice were often of the greatest value. These gentlemen, it is needless to say, neither individually nor collectively, are responsible for any opinions expressed in this paper.

Before the paper, the PRESIDENT: I do not think that I need occupy your time to-night by any introductory remarks, because Mr. Stanley Gardiner, who is the lecturer of the evening, appeared before us so lately as last June, when I had the pleasure of giving a sort of summary of his geographical career; and the paper which he read us in June on the Indian ocean, of which this present paper is practically a continuation, appears in the current number of the *Geographical Journal*. I think I had better, therefore, just call upon him at once to read his paper.

After the paper, the PRESIDENT: We have here to-night among those present Lord Stanmore, who, I believe, for years was Governor of the Mauritius and Seychelles, and if he would say a few words we should be very much obliged to him.

Lord STANMORE: It is more than thirty years since I last saw the Seychelles, and

therefore I am afraid I cannot add anything very novel or give any of the latest information to supplement my friend Mr. Stanley Gardiner's lecture. What I can say with great truth is, that I, I believe in common with all of you, have listened with very great interest to what he has said, and have admired greatly what he has shown us. Some of those photographs have brought back to me scenes which I have not seen, as I have said, for a very long time, but of which I retain a very vivid memory, and recall to me some of the pleasantest days of my past life. It was always a great relief to me to go up from Mauritius to Seychelles, and, in the charming scenery and lovely climate of that group, to refresh one's self from the fatigues which are incident to a life in Mauritius. But much pleasure as I felt in listening to Mr. Stanley Gardiner, I cannot deny but that he caused me some pain and regret, for I perceived, from the absence of any representation of them in his photographs, that the fine forests which existed in Seychelles some thirty-five years ago appear to exist no longer. With the exception of a large dead tree, we saw nothing in the photographs of anything like forest; what we did see was a great expanse of bush, and I am sorry that this is the case, because it is a great misfortune to the Seychelles, and it will ultimately, no doubt, affect the climate and many other things there. Then, again, with regard to the vegetation, he explained to us how it had been destroyed; it was not the result of forest fires, but arose from causes of decay of which he told us. Now, there again is a great change since the days I remember. In Mauritius one used to see, in the forests there, great gaunt stems of trees standing up everywhere amongst the greener foliage, and the contrast which was presented to one from seeing nothing of the sort was a great relief. Now, I am afraid, Seychelles seems to be much in the same way as Mauritius in that respect. Those are great changes. Mr. Gardiner also told us—and that I also heard with regret—that he inclined to the opinion that the vanilla industry, which was only starting in my days, has proved to be not a success, and that he fears it ought to be given up. That, too, is a thing to be lamented. But I have really nothing to tell you or to teach you; I have merely come up here to thank Mr. Gardiner in your name, as well as my own, for the pleasure which he has given us, and to say that it is to me a very great pleasure indeed, because Seychelles is a little-known place, and one does not often hear much about it. It was my fortune to be connected more with its political history than anything else, but still, during my stay there, I always gave a large portion of my time to the natural history, to the fauna and flora of the country, which Mr. Gardiner has told you—but I think, perhaps, he has hardly dwelt strongly enough upon the fact—is in many ways quite distinct from that of any other place. I am afraid some of those species have since been exterminated, but the number of birds and of plants that were found nowhere else was, five and thirty years ago, quite remarkable.

The PRESIDENT: As we are dealing with governors of the Seychelles, I will call upon a gentleman of the Colonial Office upon whom the administration largely falls—Mr. Bertram Cox.

Mr. BERTRAM COX: Among the many interesting pictures which Mr. Stanley Gardiner has been kind enough to show us this evening there was one which more than another particularly appealed to me. It was one which represented a mill, with a negro sitting beside it, a large pole coming out from the mill, and six animals of an asinine character engaged in driving that mill round. If you take the mill as representing the colonies, and the gentleman who sat beside it as the native inhabitants, I think you may take the animals who were driving that pole round as representing the office I have the honour to serve. They have their uses, and their business is to keep these particular mills and these particular colonies grinding as

far as they can, and turning out the good work of which our colonial officials are so eminently capable. To the Colonial Office all colonies are equally distant and all colonies are equally important. Political officials who serve in such out-of-the-way places as Seychelles often consider that they are in a backwater, and are neglected and are unknown; but that really is not the case, because in the colonial service in this country we live from mail to mail; we are a great correspondence department, we get dispatches in by all mails, we have to answer them, and in the mean time to find out what we can do to carry out the wishes of the colonies and those improvements which are so essential to make them prosperous. Now, in the Seychelles we suffer from a great difficulty, and that is communication. As Mr. Stanley Gardiner has told us, Seychelles would form an admirable sanatorium for East Africa, and also for other parts of the world, but the difficulty is the mail service; a mail service cannot be got without a subsidy, and a subsidy cannot be got without a contribution from Seychelles, which is rather more than Seychelles can afford to give. It is true the Imperial Government does give a certain contribution for the mail service, but that contribution is not sufficient to give Seychelles the continuous and regular service which it ought to have, and which I hope some day it may get. But at present that is the main difficulty standing in the way of Seychelles becoming anything like a sanatorium for East Africa. With regard to vanilla, it is perfectly true that the vanilla crop has not been of late years what one hoped it might be, and Seychelles has been in great danger, I grieve to say, through not having any staple commodity to fall back upon, though for many years the Colonial Office has been urging on the various governors the necessity of endeavouring to do all they could to get some other product which would take the place of vanilla, and give the planters and the people something to fall back upon when the vanilla failed, as it was felt that vanilla must fail. That has been done to a great extent, first in the case of coconuts, and, secondly, in other productions, such as coffee, which my friend, Prof. Dunstan, thinks is not so likely to succeed as copra. Mr. Sweet-Escott, the late governor, founded a botanical station, in which plants and grain have been cultivated, and where some of the inhabitants have been trained to take an interest in these productions. This garden has been made an object lesson for the planters, in order that they may find new productions to take the place of vanilla. I think in that way Seychelles will very probably tide over its difficulties. This present time is a critical one. The vanilla has failed; it has been competed with by this terrible vanillin, which I was told was made of turpentine, but which I afterwards found came from oil of cloves; and the natural crop has been disappointing. We can only hope that the other products which have been introduced, and the excellent system of roads which Mr. Escott opened up, may lead to that greater prosperity of Seychelles which it will always be the interest of every Secretary of State for the Colonies to promote as far as in him lies.

The PRESIDENT: I will now ask Mr. Henniker Heaton, M.P., if he will say a few words. He knew the Seychelles very well.

Mr. HENNIKER HEATON, M.P.: The reason I have been selected to speak about Seychelles is probably because I have visited it about a dozen times. It is a matter of wonder to me that the Royal Geographical Society, which has done so much in past years in sending out explorers and navigators, has not fitted out a great expedition and chartered a great steamer to carry ladies and gentlemen of the Royal Geographical Society to those beautiful parts of the Earth they were the means of discovering in past years. This expedition that I suggest to the Royal Geographical Society might extend its journey to other islands in the South Seas, known to Lord Stanmore, over which he ruled for many years, and it would give great delight to visitors in search of health and rest, and it would have a great

educational influence. In regard to the Seychelles themselves, they are indeed a glorious possession; every bit of soil, if cultivated, I am sure would, if tickled with a hoe, smile with a harvest. It is a wonderful place, but suffers from its being on the road to Nowhere! That is one of the reasons why it does not flourish. It is a most delightful island in a most glorious spot, and I do not differ from the man whose memory is very dear to us, General Gordon, in his view that the Seychelles was the original Garden of Eden.

The PRESIDENT: Would Prof. Wyndham Dunstan say a few words?

Prof. WYNDHAM DUNSTAN: I should like to add my testimony to the expression that has already been given with reference to the great interest of Mr. Stanley Gardiner's paper. My only regret has been that he said so little about a subject on which he is so well qualified to speak, namely, the fauna of the islands. Lord Stanmore alluded to the interest he took in the birds of the island when he was governor; but we did not see a single bird in any of the photographs, and I am sorry Mr. Gardiner said nothing in his paper about the birds or the animals. Perhaps he has reserved that for a special paper to be delivered elsewhere. It is extraordinary how little is known about the Seychelles in this country. There are a number of people who are interested in turtle soup, and who enjoy eating it, but there are very few who are aware of what Mr. Henniker Heaton has reminded us, that one of the most esteemed forms of that delicacy comes from the Seychelles, as is well known to certain cooks in the city of London. These islands have a most excellent climate, are well adapted for European settlement, and, in my view, they have great commercial prospects; but they suffer from two difficulties at the present time—one is the defective transport, to which Mr. Bertram Cox has alluded, and the other is the absence of British capital, and of information here as to what the resources precisely are. The present governor, who always strikes me as one of the most enlightened of colonial administrators, is taking a very great interest in the industrial development of the territory over which he rules. He realizes that upon the commercial development of the Seychelles depends the possibilities of good government and sound administration, and in recent years he has had an extremely difficult time owing to a diminishing revenue. Now, this diminution is chiefly due to what I regard as an economic mistake. It is the mistake of putting all your eggs into one basket. The planters of Seychelles have depended for many years upon one crop, and virtually only one crop, namely, vanilla. Mr. Gardiner has told you something about vanilla. I am by no means pessimistic about vanilla if it is cultivated in Seychelles in conjunction with other crops, but we may be perfectly certain that it can no longer be regarded as the staple industry of the colony. That is principally due to a situation about which I desire to remove some misapprehension. We have been told by Mr. Gardiner that it is due to the competition with vanilla of a "chemical substitute." I wish to explain that this is not a chemical "substitute" in the strict sense of the word, but it is a plant product reformed by chemical means. What chemistry has done is not to produce a substitute for vanilla, but to produce the very substance to which the plant chiefly owes its aromatic value. It is a question of producing, not from turpentine or coal-tar, but from oil of cloves, a material (vanillin) which is identical with that found in the plant. If this fact is realized, I think one sees at once that the doom of vanilla as a staple industry is certain; the material is produced more cheaply by chemical means than by what one may call vegetable means. Mr. Gardiner alluded to another cause for the falling off in the revenue from vanilla, a purely secondary cause, a defect which I believe can be remedied—that is the inferior quality of vanilla as compared with that produced in some other countries. That is a matter of better selection and cultivation; in fact, there are signs already

that when some attention to this matter has been given, the vanilla in Seychelles will be very much improved. No doubt it will be able to hold a place as a subsidiary industry in the colony, as by some the use of vanilla is preferred to that of synthetic vanillin.

I have taken a very great interest in the commercial development of the resources of the Seychelles through the applications of science. I have acted, in fact, as the humble instrument of the Colonial Office, through which the government of the Seychelles is controlled. I am unable to state what animal I may represent in Mr. Bertram Cox's parable; none was small enough to be seen in the picture. I should like to allude to one or two matters which seem to me to present considerable possibilities from the commercial side. You have heard a great deal about coconuts. There is no doubt that the production of copra, of which Mr. Gardiner has given you an account, will be an important matter. Further, the production of oil from it, I agree with him, might be conducted with less primitive methods. I do not think he mentioned that at the present time soap is being actually produced in the Seychelles from coconut oil. I believe that is likely to be a profitable industry, although the soap, you may regret to know, is not likely to come to this country, but goes principally to East Africa. Then there is another matter in which I have taken some interest. The banana of Seychelles differs in some respects from the banana of Jamaica, and produces, when dried and powdered, an orange-coloured flour suitable for certain food materials which are being manufactured in this country. I have been the means of bringing under the notice of some English manufacturers the peculiarities of this banana flour, and I am glad to tell you that at the present time machinery is being employed in the Seychelles for the desiccation of the banana and the production of the flour, which seems likely to be largely consumed in this country. Another matter of more importance is the guano of the Seychelles, and the phosphatic rock formed from it which has recently been brought to light. That rock appears to have been formed by the washing through from the guano of phosphate of ammonia. This has produced from the underlying coral what is virtually a phosphate of calcium, which is largely used as a manure for agricultural purposes, and the shipment of which is a very profitable industry in Florida and elsewhere. This can only be a temporary industry. The growing of plants which give essential oils and perfumes, lemon-grass, and others appears to be easy in the Seychelles, and I believe that an oil-distilling industry may be successful. But far more important than these is the question of growing rubber. I must not take up your time by any lengthy discussion of the rubber problem in connection with Seychelles. There has been a very large increase in the past few years of rubber-planting all over the world, and most of us who have looked closely into the question know that the demand is likely for some time to exceed the supply, and therefore it is certainly worth while considering the question of rubber-planting in the Seychelles. Mr. Stanley Gardiner has told you that to some extent it has been ascertained by actual trial that the tree which furnishes Para rubber grows very well in the island, but, unfortunately, it is not safe to conclude that on this account alone a rubber-producing industry will be certain success. I think myself it is very probable that it will be found that these trees will produce good rubber, but, so far as I am aware, that has not been actually proved, because it is not possible to tell, until a tree is between six and seven years old, whether it will furnish good rubber or not. A rubber tree may flourish, as it does in certain parts of India, but nevertheless produce very poor rubber, and, so far as I am aware, the trees in Seychelles are at present only between three and four years old.

One of the most important means through which the industrial development of

the Seychelles will be promoted is through the station which Mr. Bertram Cox has mentioned, the Botanic Station, which is now under the direction of Mr. Dupont. It has already done excellent work in the sense of providing object-lessons for the planters of the growth of economic trees and plants that might be introduced into the islands. In my view, the most pressing need in the Seychelles is for the better endowment and extension of that station; in fact, for its conversion into an agricultural experiment station. I believe no more important step could be taken for the prosperity of the Seychelles than the development and extension of the present small department, so that systematic trials can be made in the cultivation of all kinds of plants and crops, and information given to the residents in these matters.

The PRESIDENT: We have here to-night the son of the enlightened governor to whom Prof. Dunstan has referred, and perhaps if he will say a few words on Seychelles up to date, we shall be very much obliged to him.

Mr. DAVIDSON: I came here to-night with no expectation of being in any way called upon to speak, and indeed my only claim to speak is that I returned only a month ago from the Seychelles. Mr. Gardiner has told you far better than I can of the beauty and of the capacity of the islands; and Prof. Wyndham Dunstan has most ably detailed the experiments that are being tried to rescue the islands from the trough of the wave into which they have at present fallen. It is perhaps interesting to state that shortly before I left I saw some rubber trees which had been tapped. I think they were between six and seven years old, and the rubber was pronounced by Mr. Dupont, the head of the Botanic Station, to be of really good quality. Certainly all the suggestions which Prof. Wyndham Dunstan made would materially contribute to the prosperity of the island, but, unfortunately, all these experiments require considerable expenditure of money. The island at present is barely paying its own way, and must continue for some years to be in a state of poverty; consequently it cannot have its resources developed to the fullest extent, except by the introduction of outside capital, either in such enterprises as the desiccation of coconuts—for which a Belgian company has been formed recently—or in the removal of phosphatic rock, which is likely to be of considerable pecuniary profit to the islands, even though they may lose somewhat in superficial area.

The PRESIDENT: I will now ask you to give a vote of thanks to Mr. Stanley Gardiner for his most delightful paper, and I will at once make way for him to reply.

Dr. ARTHUR HAYDON: Mr. Stanley Gardiner made some reference to the possibility of a sanatorium being placed on a plateau in Mahé island. He also mentioned the fact that there was an entire absence of all fevers on the island. What I would like to know is, did he include in that the well-known jungle fever which is so prevalent in India? and if the place is so extremely healthy, and a sanatorium could be erected in the most suitable place on one of the islands, perhaps the supply would create the demand, and possibly a steamship service from the neighbouring mainland once in three months, bringing over a certain number of invalids, might contribute towards the prosperity of the islands.

Mr. J. STANLEY GARDINER: I would desire, in the first place, to express my gratitude to you for the patient way in which you have listened to me to-night; and I would also thank the various speakers for the kind tone of their remarks. I may perhaps reply to Dr. Haydon first. So far as I am informed, there is no jungle fever, and, looking at the conditions of the islands, I cannot see that it could, even if introduced, get any hold. I was particularly interested in Lord Stanmore's remarks on the forests in the Seychelles, when it was a dependency of Mauritius, of which he was governor. I regret that the visitor now, after the lapse of thirty years, can see none of the jungle as he understood it. All the high trees have been cut down, or killed out by the beetle to which I have referred. The indigenous

birds are becoming extinct; in fact, most species are extinct. There is a law for the protection of birds. This is as it should be, but this law was copied from the law in Mauritius, and it presents the curious anomaly of protecting in the Seychelles archipelago the birds of Mauritius, scarce one of which is actually found there.

I fear that I cannot entirely agree with all the remarks of Mr. Bertram Cox and Prof. Dunstan. In the first place, the gardens were not established as an economic station; they were mainly botanic gardens, and were planted partly for beauty and partly for the amusement of the people of Port Victoria. They are situated close to the coast, whereas the greater part of the planting land is up at from 600 to 1200 feet. I cannot say that in my opinion they had done, or attempted to do, much for the planters up to a couple of years ago, though I willingly bear testimony to the very admirable work they are doing now. With regard to communications, to which Mr. Henniker Heaton, I think, also referred, it is to be regretted that the only regular service is by a French line, the Messageries Maritimes, whose heavy charges for freight are a severe handicap on the planters. With Prof. Dunstan, in his remarks on vanilla, I very largely agree; but I do not attribute its fall in price mainly to the discovery that vanilla can be isolated from oil of cloves, but to competition with other countries. I do not believe that there will be any improvement in its cultivation, or in methods of cultivation in general, until there is individual ownership of property. I do not believe in enterprises in tropical countries, when the land is divided up, on the death of the owner, among his children. I think, when in a few years' time the agreement, under which the law of the country is the Code Napoleon, comes to an end, and when presumably the law will be the law of England, that development is likely to take place with respect to planting. Prof. Dunstan did not refer to another development of the banana, *i.e.* its drying. Experiments were being made, and an article was being produced, samples of which I brought home. Even after six months the dried bananas made excellent sweets or futters, and it may be that they may become ultimately as popular as the dried apple. Bananas can, roughly speaking, be produced at one hundred per quarter of a rupee, so that any good method of drying is likely to be of considerable commercial value.

NINE YEARS' SURVEY AND EXPLORATION IN NORTHERN AND CENTRAL CHINA.*

By Lieut.-Colonel A. W. S. WINGATE.

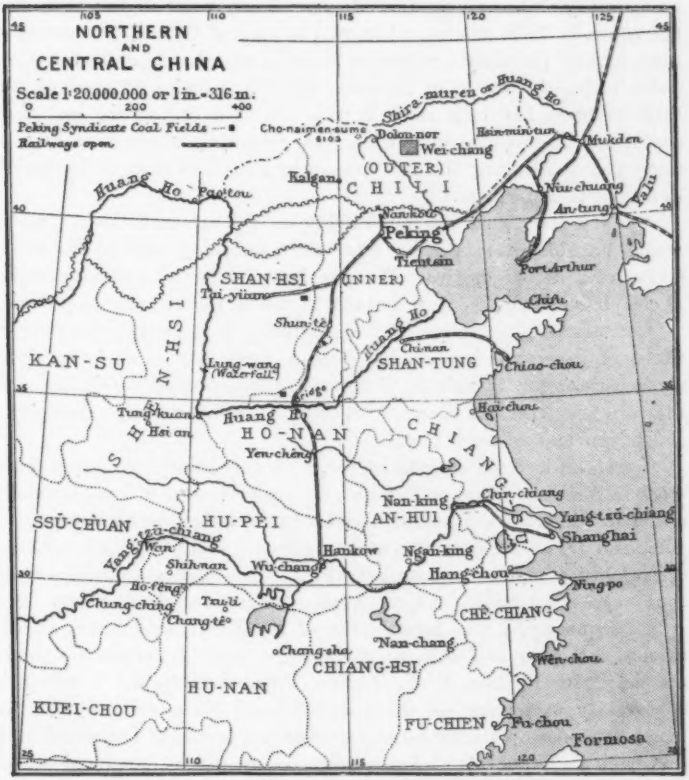
THE title of the paper which it is my privilege to read before the Fellows of this Society must appear somewhat ambitious. I need hardly remind any one that it would be beyond my powers to traverse, in the limited space at my disposal, the vast extent of territory covered by the many British explorers who have travelled in Northern and Central China during the nine years that I have been connected with the Far East.

In the words of the Rev. Arthur Smith, "China is a vast empire, proverbially difficult to understand, no matter what the length of time may be which has been spent in it; therefore it is important to be on one's guard against those cheap and easy solutions of a difficult and

* Read at the Royal Geographical Society, December 17, 1907. Map in the next number of the *Journal*.

complex problem, which, by misrepresenting some of the factors, omitting others, and remaining in total ignorance of yet more, may be able satisfactorily to explain everything about China in a few succinct and well-turned paragraphs."

Since first I landed in Shanghai in September, 1897, many world-stirring events have occurred, and did space and my profession permit, I



would have liked to dwell, in spite of Arthur Smith's wise warning, upon some of the great changes which have so altered the map of the Far East, and have transferred the hub of the diplomatic wheel from Constantinople to Peking. In the preface to what is, I believe, the only handbook of geography of the Chinese Empire, which was published last year, the learned editor, Père L. Richard, says:—

"While engaged on this work, it has been more and more brought home to me that the day has not yet arrived for the publication of

a strictly scientific geography of China. Although for certain districts and provinces there may be no lack of authoritative information, for others there are only conflicting statements, or else complete ignorance.

"There are, for instance, differences of altitude, ranging from 3000 to 5000 metres in well-known localities, and this, too, in scientific works by authors renowned for their accuracy. We will not speak of the populations of provinces and towns, the wealth of the country, the navigability of the rivers, the climate. Then what of the position of the towns? With the exception of the map of Chih-li,* in course of preparation" (possibly a reference to a Chinese edition of the Survey of India map.—A. W.), "all accurate mapping remains to be done, and little progress has been made in this direction during the last three centuries. In political and economical geography, there have been so many changes during the last few years that it is next to impossible to keep abreast of them.

"It is a *new* China which is arising on the ashes of the old, and it would be difficult to predict what the awakening will be like in the course of a decade or two. We may be spectators of a transformation as complete as that of Japan, but of a slower and more rational growth."

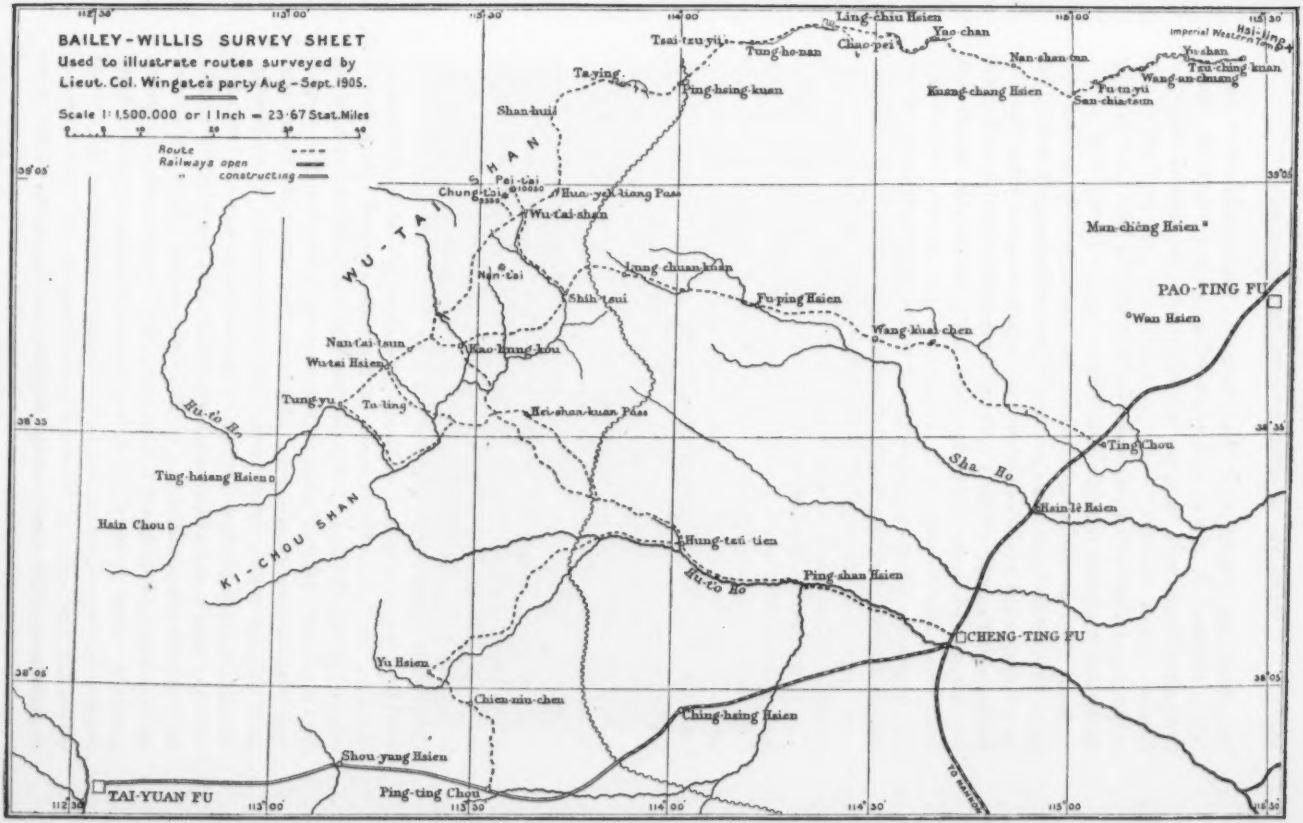
Commercial geography and the geography of railways must also, for the next generation or two, be given a prominent place in speaking about China; for, though the Chinese are before everything else farmers, they are none the less, one and all, in their spare moments travellers, and buyers and sellers of goods.

I propose, in the first instance, to review very briefly the geographical work in Northern China with which I have been more or less personally associated, in order to illustrate the changes which our maps have undergone, and are still undergoing, and to give an idea of the large amount of exploration and survey work that has been quietly accomplished in those regions by British subjects during the last half-dozen years.

Subsequently, I will relate some of my experiences during recent travels, last year and this, in the eastern part of Central China, in company with Captain F. G. Turner, Royal Engineers. I take this opportunity to remark on the energetic and persevering manner in which this officer, with the assistance of only a couple of Indian military surveyors (not Survey of India men, be it noted), produced under adverse circumstances excellent surveys, portions of which are given in the maps which accompany this paper.

The region over which our explorations extend is shown in the inset map. Of this region only three areas have been properly triangulated and surveyed by British surveyors; they are Inner Chih-li, a portion of Northern Ho-nan, and the Wei-hai-wei territory. The

* The system of orthography here adopted is Sir Thomas Wade's, except for well-known places, such as Peking, Shanghai, Hankow, etc. The term "Péchili," so common on existing maps, is never used in China, and has no real justification.


BAILEY-WILLIS SURVEY SHEET
Used to illustrate routes surveyed by
Lieut. Col. Wingate's party Aug.–Sept. 1905.
Scale 1: 1,500,000 or 1 Inch = 23·67 Stat. Miles
Route
Railways open
" constructing
Ling-chiu Hsien
Tsai-tzu-yü
Tung-ho-nan
Chao-pei
Yao-chan
Nan-shan-tan
Hsi-ling Pass
Imperial Western Tomb
Yu-shan
Tzu-ching-kuan
Wang-un-chuang
Fu-tu-yü
San-chia-tsun
Kuang-chang Hsien
Ta-ying
Ping-hsing-kuan
Shan-hui
SHAN
Pai-tai
Chung-tsia
Hua-yen-kiang Pass
Wu-tai-shan
WU-TAI
Man-ching Hsien
Nan-tai
Ling-chuan-kuan
Shih-tsui
Fu-ping Hsien
PAO-TING FU
Wan Hsien
Wang-kuai-chen
Nan-tai-tsun
Kao-ling-kou
Wu-tei Hsien
Tung-yü
Ta-ling
Hsi-shan-kuan Pass
Fu-to Ho
Ting Chou
Sha Ho
Ting-hsiang Hsien
Hsin-le Hsien
Hsin Chou
KI-CHOU SHAN
Hung-tai-tien
Ping-shan Hsien
Fu-to Ho
CHENG-TING FU
Yu Hsien
Chien-niu-chen
Ching-hsing Hsien
Shou-yang Hsien
TAI-YUAN FU
Ping-ting Chou
TO HANKOW
38°05
38°35
112°30
113°00
113°30
114°00
114°30
115°00
115°30

balance of the survey work done is in the main confined to plane-table traverses of routes and plans of cities and localities. That more should not have been accomplished, with the limited means at disposal, is not remarkable if we consider the area over which our geographical explorations have extended, and that we have been working under somewhat unfavourable conditions.

Many observations for latitude have been taken, but not one for longitude. We were not equipped for this. We have relied on longitudes fixed by the navy when available; otherwise we have accepted those given on Bretschneider's map. With some notable exceptions the Jesuit Fathers did this part of their work admirably, and it is for this reason that small-scale maps of China are in the main accurate in respect of latitude and longitude. It is in the details of hydrography and relief of the land that they fall so far short of the modern maps of other countries.

In these matters, until after 1900, the greater part of China was almost as unmapped as Central Africa used to be.

For the results obtained, thanks are due to individual explorers, and to companies, such as the Peking Syndicate and the British and China Corporation. Except indirectly, and by the loan of instruments, I do not think the Royal Geographical Society has contributed towards the expenses of China exploration—at any rate, in the region with which I am now concerned.

Prior to 1900, foreign (by which is meant anything not Chinese) maps of China were extremely defective. The best were those of Bretschneider (1 : 4,600,000), Waeber (1 : 4,355,000), and Richthofen (1 : 750,000), based almost entirely on Chinese maps—produced in the reign of the great emperor K'ang-hsi (1708–18), under the direction of the Jesuit Fathers—with the assistance of British Admiralty charts. Now, Chinese maps are better than none at all; indeed, sometimes, in in the hands of those who understand them, they are very useful; but, although the more recent ones show a great improvement, they are not what we are accustomed to call maps nowadays. As in so many other instances, the Chinese Government, having made a splendid start, seemed satisfied to let things be. We are sometimes advised to "let sleeping dogs lie;" the Chinese do not require urging in this respect—in geographical matters, at any rate! Hitherto they appear to have acted up to both the letter and the spirit of this ancient maxim. Consequently, though the distinguished men above mentioned accomplished wonders with the scanty and often inaccurate material at their disposal, their maps are sometimes misleading on important points. Two maps based on those above mentioned, which have had a wide circulation and served a useful purpose, are the China Inland Mission 50-miles-to-the-inch map, and the one-to-a-million German map. Compare, for instance, the courses of the Hsi Liao Ho, Lao Ho, Pei Ho, or Huang Ho, as depicted on any of those maps, with their courses as shown in the sheets of the most

recent maps issued, or shortly to be issued, by the Topographical Section of our War Office. However, as the triangulation of Japan was only completed in 1880, we must not expect too much of the Chinese maps.

Inner Mongolia or Outer Chih-Li Province.

Six years ago the large tract known as Inner Mongolia was practically unmapped and very inadequately explored. To the average foreigner, and to most Chinese, it was generally supposed to be a wild, robber-infested, unproductive country inhabited by nomad Mongols. Yet it was through the heart of this region that a Manchu army found its way to the Chih-li plain when the main army was successfully

VIEW FROM PAI-HUA SHAN (7000 FEET) ON THE MORNING OF MAY 20, 1905.

blocked by the Chinese at Shan-hai-Kuan, where the Great Wall enters the sea. Again it was at Je-ho (the name signifies "Hot Stream," and is commonly called Jehol) that our ambassador, Lord Macartney, was royally entertained by the Emperor Ch'ien-lung in 1793. Huc, writing in 1844, says it is twenty years since any Emperor hunted there. No Emperor has visited Je-ho since Hsien Feng died there in August, 1861 A.D.

The palace and grounds, which have a circumference of 16 miles, are still there (1904), though the former is in a dilapidated condition. The last royal visitor was the present Dowager Empress in 1860. Staunton has left an interesting and, so far as relates to geography, an accurate record of Lord Macartney's journey to Je-ho and neighbourhood. He says, "The town of Jhe-hol, excepting the houses of the mandarines,

consisted of miserable hovels full of people. The streets were crowded, crooked, unpaved, and dirty." This description is as true to-day as when written over one hundred years ago. He also gives a plate and description of a remarkable natural column of conglomerate (some of the stones in it are over a foot in diameter), which is a conspicuous feature in the landscape, visible from several miles distant. This column is still there. Staunton's description and the drawing of it are in the main accurate.

How many hundreds or thousands of years, I wonder, since it formed the core of the mountain on which it stands, and its top the mountain summit? When will it topple over? It is more than 180 feet in height, measured from its base on the rock which forms its pedestal; on the top are some flat rocks and bushes which serve as some protection against the effects of water and wind, thus giving it a peculiar carrot-shape appearance. Its height and bulk may be judged by comparing it with the figure of a man standing in the niche at its base, shown in the photograph taken by me in 1904. It has apparently undergone no change during the hundred years or so since Staunton's engraving was made. There are several other similar formations in the district—all silent witnesses of the geological age of these mountains, and of the effect of water action on the softer, surrounding materials, which have been carried away to help in making the Chih-li plain. I am not a geologist, and therefore cannot explain what seemed to me a curious fact—namely, that all the columns which I saw (three of which I photographed) appeared to be of equal height. While on this subject, I may add that Staunton's plate shows a good-sized cargo-boat in a position where now it could not well be, owing to lack of sufficient water. At Je-ho there is a potala, after the style of the one in Lhasa, but, of course, on a much smaller scale. In outward appearance it remains as of old, but inside much destruction has taken place, one large chamber being a mass of ruins, the roof having fallen in, burying in the *débris* many valuable works of art.

It may be of interest to note here the influence which the great potala of Lhasa has had upon the architectural design of its namesake at Je-ho. This is well illustrated in the photograph, taken by me at Je-ho in 1904. The glory of the first has survived, but the sun of the latter is now well set. Since emperors have ceased to interest themselves in any of these once beautiful temples, funds have been insufficient to maintain them in their pristine magnificence. Though, sad to relate, many of the precious works of art which they contained have disappeared, there are a few of extreme interest remaining. At Je-ho, among others, is the jewelled sword of the Emperor K'ang-hsi, and a very fine solid silver elephant of Indian or Siamese workmanship, doubtless a present in the days when Nepal and Siam were tributary states.

I do not think I can add much of importance or interest to the numerous accounts of the sights of Je-ho; one of the most recent is

that of Mr. Claude Russell in the number of the Royal Geographical Society's *Journal* for May, 1904. But in 1904, in place of the 800 lamas, which Staunton tells us were in the potala in his day, there were barely a hundred, while the number of mandarins and troops had dwindled from 100,000 and 80,000 to about 1200 and 800 respectively. These facts speak volumes for themselves; they represent with truth the state of affairs regarding two of the most important things for the future welfare of the Chinese—religion and defence. Both have been allowed to decay throughout the length and breadth of the Celestial Empire. Whenever one visits some famous place or building, the thought that springs uppermost in the mind is "Sic transit gloria mundi."

CONGLOMERATE COLUMN AT JE-HO (TAKEN OCTOBER, 1904).

Inner Mongolia, then, is a more or less mountainous region lying outside the Great Wall, between it and the real Mongolian grasslands which commence about lat. 42°, and would now be more appropriately called Outer Chih-li. Its mountains are rich in minerals, which have only been partially exploited; much might be done by the introduction of modern methods and machinery.

The ubiquitous Chinese have long since either ousted or absorbed the docile and more ignorant Mongols, and have introduced Chinese administration and methods. This procedure still goes on in yearly increasing force. It will not be more than a few generations until the Mongols will occupy a position in the empire similar to other early tribes, and will become lost among the Chinese colonists. Von Möllendorff called attention to this in the R.G.S. *Journal* of February, 1881, in which he stated that on political, ethnographical, and geographical grounds, the extra-mural parts should be regarded as a portion of China Proper. The time seems opportune for the relegation of ancient tribal names to the historical atlas.

Its administration, also, now differs hardly at all from Inner Chih-li, the chief difference being that Jeho is one of the last remaining districts over which the Tartar-General in reality has the principal control. Outer Chih-li has no governor. Nominally the viceroy controls both

Inner and Outer Chih-li. Very little has been published in the English language concerning it, though much valuable information will be found in Dr. O. Franke's learned work, 'Beschreibung de Jehol-gebietes in der Provinz Chih-li,' published in 1902. This distinguished traveller has borrowed rather freely from Chinese works dealing with that region, so that he has fallen into some of their mistakes, which have been repeated in the latest geographies and maps. Especially is this the case with respect to the Wei-ch'ang, or Imperial Hunting Ground, and the courses of the Hsi Liao Ho and Lan Ho.

The Wei-ch'ang lies between Jeho and the famous mart of Dolonnor, or Lama Miao. This part of Outer Chih-li is full of geographical interest and historical associations. Its forest-clad hills and dense undergrowth afford a glimpse of what must once have been the general appearance of the whole of North China beyond the limits of the Great Plain. But the Chinese consume everything, and have so bared these northern hills as to leave scarcely a tree. They are paying dearly for their foolish shortsightedness. By acting thus they have probably altered the rainfall, which now descends in sudden heavy bursts, flowing quickly down the bare slopes, conveying with it much fertile soil, and often crops as well, besides causing floods and wholesale devastation in the lower reaches of the rivers of the Great Plain. In mitigation of the evil, however, is the fertilizing nature of this deposit once the floods have subsided. With a judicious system of afforestation, the region beyond the Wall would support a much larger population, and enjoy a mere equable climate.

Once—as Chinese maps bear evidence—the imperial hunting reserve extended far beyond its present limits. Dr. Franke gives it as 110 miles from east to west, and 70 from north to south, with a circumference of 450 miles; but the gradual advance of the Chinese immigrant has encroached upon this beautiful country to such an extent that it now covers an area of only 45 miles from east to west, and 55 miles from north to south, or, in round figures, 2500 square miles.

The present limits are from 116° 50′ to 117° 40′ E. long., and 41° 40′ to 42° 35′ N. lat. It forms a rough parallelogram, of which the four corners are—south-west, Kuan-Ti; south-east, Shih-pien-tzu; north-west, Yang-shu-pei; north-east, Hsia-po. It has now a circumference of only 230 miles, or 220 miles less than Dr. Franke's estimate.

Before many more years it is probable it will be completely thrown open to cultivation, as has been done in the case of similar reserves in Manchuria. Then good-bye to the last remaining bit of virgin forest in North China.

Thus, though many travellers have visited this region since the days of Marco Polo, Huc, and Gabet, when it formed the happy hunting-ground of Mongol and Manchu emperors, who sought in this bright, cool atmosphere relief from the dust and dirt of Peking, while chasing

the red deer through its wooded glens, it has been left to modern explorers, such as Doveton, Gunter, Woods, Russell, and others, thoroughly to examine and partly to survey it. Lieut. Doveton, in the summer of 1904, succeeded in penetrating further into this sportsman's paradise than any one.

He was prevented crossing from north to south, and again from west to east and east to west, not, as might reasonably be supposed, by the imperial forest rangers, but by a band of lawless robbers who regard this last reserve of forest and game as their especial preserve. Though a few shots were fired, rather by way of an exchange of cards than with any idea of conflict, Doveton and his party, bent only on geographical research, thought discretion the better part of valour, and on each occasion withdrew.

Concerning the Wei-ch'ang, Lieut. Doveton writes as follows: "It is, perhaps, the most interesting and least explored tract of country in Outer Chih-li province. So far as I am aware, no published description of it in the English language exists, though several of the early explorers penetrated as far as what is now the north-east corner. Gerbillon and Verbiest, at the end of the seventeenth century, describe the country near the sources of the Ying and Pai-ch'a rivers, and the latter mentions a mountain which he calls 'Petcha' (and speaks of as *un amas de plusieures montagnes*), covered throughout the year with snow, which, he suggests, may be due to its great height (9 Chinese li, or about $2\frac{3}{4}$ miles), and which he calls "large," giving a height of from 10,000 to 14,000 feet.

This mountain is, without doubt, Ta-kuang-ting-tzu, the highest point in the Wei-ch'ang, which can be distinctly seen from the plateau several miles away to the north-east. The probable reason why these early explorers did not penetrate further into this forest is because of its density and the very thick undergrowth, which even now is difficult to pass through, and in earlier days must have formed a complete barrier to man and animal transport. Most of the game used to be, and what is left of it still is, found near the base of Ta-kuang-ting tzu, north-east of the Lao-ling pass. The story goes that once when the Emperor Ch'ien-lung was riding after his quarry his pony stepped on a large flat rock, which is still to be seen, bearing the mark of his horse's hoof. There is no doubt there is such a mark, as my informant volunteered to show it to me."

Consequently, although since 1900 we have lifted the veil which hitherto surrounded, like that of the Forbidden City in Peking, this old-time imperial pleasure-ground, now the hiding-place for lawless people, yet there still remains this virgin spot of about 300 to 400 square miles, for some future venturesome spirit to explore and map.

Lieut. Doveton also visited Shang-tu or Cho Naiman Sume (108 temples), as the Mongols call it, the site of the ancient capital of the

Yuan Dynasty, and described by Dr. Bushell in a paper read before the R.G. Society in 1874. Mr. C. W. Campbell visited these ruins in 1902. The only additional information which Doveton has brought is a set of photographs showing the actual condition of the ruins just thirty years since Dr. Bushell's visit, and about six hundred since the Mongol Emperors lived there. Just outside the remains of what was once the city wall is a well which, on June 16, 1904, was coated with ice 4 to 6 inches thick and 6 to 7 feet below the surface of the ground.

Mr. Campbell remarks that if something is not done to preserve these relics of an ancient city, the capital of a fast-disappearing race, the Chinese settlers will soon demolish all that is left. One marvels that the Chinese, who are so fond of ancient things, do not take more interest in the preservation of their relics. Some day they will deeply regret having neglected to do so. Dr. Bushel states that, according to Chinese accounts, boats once ascended to Shang-tu. This may be so; in China it is as well to be careful in naming places where the Chinese will not take boats, but they certainly do not take them up the Lan Ho above lat. 41½° nowadays.

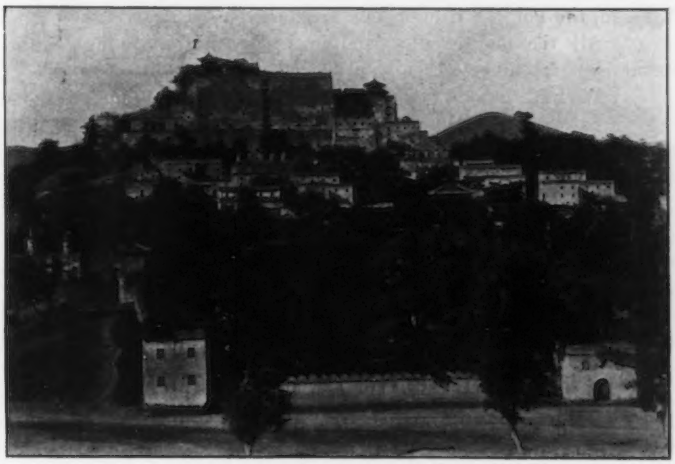
The inhabitants of Outer Chih-li differ hardly at all from those of Inner Chih-li, except that they are perhaps a little poorer and rougher, and pass under the generic term of "Mantzu" instead of "Hanjen." They suffer much from goitre. Staunton says that when he was at Jeho, the doctor calculated about one-sixth of the population had this complaint. Woods, Goold-Adams, Gunter, and others who have travelled in Outer Chih-li since 1900, also speak of the prevalence of this growth. Captain Gunter put the number of those afflicted at one-half the population of K'u-pei-K'ou.

In spite of Dr. Franke's book and Dr. S. W. Bushell's paper, much still remains to be written about Outer Chih-li, with its gold, silver, coal, and other mineral deposits, its mixed population, old-world ways, historical associations, and partly unexplored tracts; the subject is deserving of a paper to itself.

Regarding the flora and fauna, a very complete list is given in Appendix A of Dr. Franke's work. It is evidently a translation from the Chinese, and must refer to some remote epoch, as regards the fauna at least, for many of the species mentioned are no longer to be found in Outer Chih-li. Such, for instance, are the tiger, the bears, and several of the deer. Nowadays, practically the whole of the large game is confined to the eastern and western hunting-grounds, of which the former, or Wei-ch'ang, contains the greater number. There are still to be found the "Ma-lu," or red deer—a fine stag weighing about 600 lbs., and similar to that of the T'ien-shan mountains; the "Yang-lu," like a spotted deer in size and appearance; the "p'ao-tzu," the Asiatic roe-deer, with small antlered horns about 12 inches in length, weighing 60 lbs. or so. These latter are almost the only deer in the western

hunting-ground. The "huang-yang," or gazelle, is found in considerable numbers west of long. 117° and north of lat. 41°, as many as 600 being seen in herds at one time. There are also a few hog-deer ("chang") and perhaps half a dozen panthers. Hyenas, wolves, and wild cats are numerous; the latter are grey colour with long fur coats. There are grey squirrels and flying squirrels; rats, mice, moles, and snakes. Doveton brought back one poisonous snake—the *echis* viper—and saw a kind of whip-snake with fangs. Of small game—pheasants, partridges, grouse, quail, snipe and wildfowl—there is plenty (see also Dr. Bushel's paper).

In August the plateau is a mass of wild flowers of many different varieties, having the appearance of a gigantic wild garden, beautiful in colouring and fragrant with perfume. There is much wild thyme, and



POTALA AT JE-HO.

another sweet-smelling plant resembling lavender, used by the Chinese as fodder.

The principal trees are the silver birch, pine, larch, willow, cyprus, walnut, and holm oak. There is a perfect jungle of thorny undergrowth and long yellow grass. The holly tree is common.

Doveton thinks that "the forests of the Wei-ch'ang will in a few years be a thing of the past." Not so long ago the whole country between longs. 117° and 119°, and from lat. 41° right up to the Shira-muren, was dense forest. Now what is known as the "Great Forest," only covers an area of about 100 square miles of the north-eastern corner between the sources of the Ying Ho (north and south branches), I-sün Ho, Hsiao Lan Ho, and San Tao Ho. Thickly wooded slopes also extend

along the west side of the I Sün Ho, and south-west towards the Lao-ling (pass). To the west of a line drawn 5 miles from the source of the San-tao Ho to the source of the Meng-kuei Kou there are no forests, and only a few trees, which the Chinese are fast cutting down. South of the Meng-kuei Kou and of Tung Ta-po are some thickly wooded hills.

It is to be noted that, as a general rule, the southern and western slopes are bare, nearly all the timber growing on the northern and eastern slopes. Hundreds of carts are constantly engaged carrying wood west to Dolon-nor, east to Ch'ih-fêng, north to Chin-p'eng; while a good many find their way south towards Jeho.

Here I can only very briefly summarize some of the results of our explorations in that region.

(1) We have surveyed, from their sources to the sea, all the principal rivers, the Lao and Hsi Liao and their branches, the Ta and Hsiao Ling, the Lan, the Pei, the Hün or Yün Ting, the Sang Kan, and the Chü Ma.

(2) All the main routes, and many by-routes, through hitherto unsurveyed tracts have been mapped.

(3) We have located on the map a great many gold- and silver-bearing formations, as well as nearly all the coalfields, some of which have been surveyed and examined by mining engineers.

(4) The boundaries of the Wei-ch'ang have been definitely determined, with a greatly reduced area.

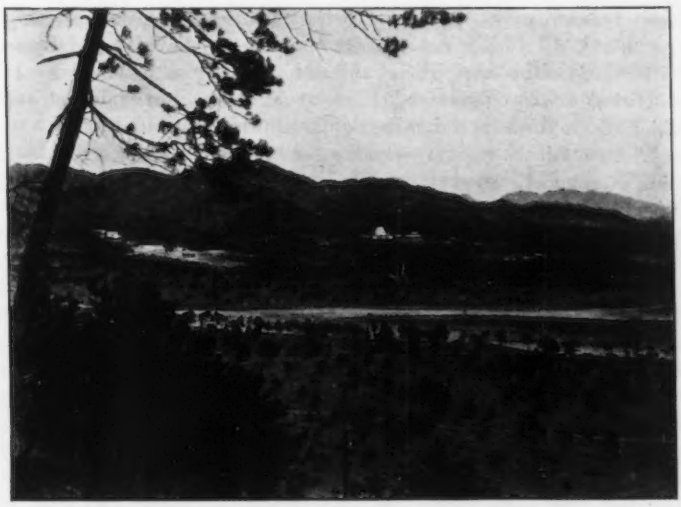
(5) The mystery of the Pai ch'a mountain has been cleared up. The accounts by the early explorers, repeated in all subsequent works and maps (even in the latest French geography, in which Père L. Richard speaks of the Wei-shan (?) as having the highest peak in Chih-li, "Le Pétcha qui atteint 3000 metres environ," see p. 76), that there is a mountain 10,000 to 15,000 feet high called Pai-ch'a or Pé tcha (there are as many different ways of spelling it as there are stories about it) in the north-eastern corner of the Wei-ch'ang, have been proved to be incorrect. Five British and two German travellers who have visited the neighbourhood since 1900 are all agreed as to the absence of any mountain of that name, and, further, that no peak of the Great Hing-an range between lat. 41° and 44° N. exceeds 7000 feet above sea-level. In 1904 Doveton ascended what, there can be no doubt, was the highest mountain in the Wei-ch'ang, and the one to which Verbiest referred. Doveton computes it to be 6500 feet above sea-level, and states that the local name is Ta-Kuang-ting-tzu, a name which has not hitherto appeared on any foreign map.

Pai-ch'a is the name of a tributary of the Shira-muren (or Huang Ho), whose headwaters (at least those which are clear) take their rise on the plateau close by, and gives its name to the district. I am unable to say definitely why this stream has been called Pai-ch'a, but hazard the conclusion that it may mean "White Branch or Fork" as opposed to the "Huang or Yellow Branch" of the Shira-muren. The

waters of the Pai-ch'a are clear, those of the Shira-muren turbid. For similar reasons, the Huang Ho or Shira-muren might be said to take its rise in the mountains north of lat. 43°, and not on the Pai-ch'a plateau, for it is the Pao-li-kou flowing from the north, and not the southern headwaters which are yellow, the southern branches being clear.

(6) The true course of the Hsi Liao Ho between long. 118° and 124° E. has been defined, and the long-standing misconception as to its real course after its junction with the Shira-muren has been removed. This survey was done by Captain Gunter, R.A.M.C., in 1903.

(7) The position of several important towns, such as Ch'ih-feng



TOMB PREPARED FOR H.I.M. THE DOWAGER-EMPRESS OF CHINA AT TUNG LING.

Hsien (Hata), K'u-lu-kou, and Wu-tan-ch'êng, have been accurately determined; other considerable market towns, not marked on any map (even on the latest one-to-a-million German sheets of this region), have been located, and some completely blank spaces have been filled with names.

(8) A valuable survey by Captain Mahon, R.E., was executed in 1902 to connect up the two surveys of portions of the Hün Ho, done by the Survey of India in 1900–01, the one section that on the Hsüan-hua plateau, and the other on the Chih-li plain. The river cuts its way through deep gorges in the Hing-an range—here completely bare of trees—affording some very grand scenery.

(9) The previously unexplored hills north and west of Peking have

been examined and partly surveyed, and additional geographical information collected.

Map of Inner Chih-li Province.

Leaving Outer Chih-li and coming inside the Great Wall, I should like to mention a splendid piece of survey work, the first regular triangulation done in China proper, if we except Wei-hai-wei, Ch'ing-tao, and perhaps some parts of Yün-nan. I refer to the "Map of Part of Chih-li Province," on a scale of 2 miles to an inch, produced by the Survey of India. Only those who have tried accurate triangulating and surveying in China can fully appreciate the amount of work which this map means. These surveys were carried out during the operations in North China in 1900–01, occupying less than eight months, by a single section of the Survey of India, under Major Renny-Tailyour and Captain Ryder, assisted by some officers and men of the China Field Force.

Owing to the curious and, I believe, still partly unexplained haze, which covers the hills and valleys of North China (and indeed the whole of the mountainous regions), to the great cold of winter, and the heavy rains of summer, triangulation and survey work are frequently interrupted. This haze is no doubt in great part due to impalpable Mongolian dust in suspension, such as Richthofen considers may have originally assisted in the formation of the loëss of North China. But, so far as I have observed, these thick hazes extend southwards and westwards far beyond the limit of the loëss, and some other reason is required adequately to explain this phenomenon. Were they due only to heat and moisture, one would expect to find the atmosphere in North China clear during the winter months. But this is not the case. The loëss formation itself is not easily accounted for. I have seen vertical walls of it at an elevation of 5000 feet above sea-level, with extensive beds of water-worn boulders, stones, and shingle buried in the middle. How did they come there? Mr. Kingsmill and others may scoff at Richthofen's theory regarding the loëss, but have they provided a better one in affirming it to be a "marine deposit"? Richthofen, in one of his "Letters," asks for a geological map of the Chih-li plain, to show the distribution of the loëss and alluvial deposits. So far as I am aware, the making of such a map is one of the many things in China still remaining to be done.

I should like here to offer a word of tribute to the late Baron von Richthofen's splendid pioneer work in China. Wherever my fellow-travellers and I have been we have always received valuable assistance from the records he has left of his work, which, considering the difficulties with which he had to contend in earlier days, are remarkably accurate.

When the map of Inner Chih-li was published, it was considered so good that it has been incorporated into the maps of China produced

by most other nations, not excepting the Chinese, who, ever quick to utilize the exertions of others, have had it transliterated into their own language. To those accustomed only to the usual small-scale, somewhat empty-looking maps of China, this one gives a better idea than anything I have seen of the density of population in the Great Plain. The villages shown fall far short of the actual number, yet they average less than a mile apart. Each village has in and around it a certain number of trees (the number depending upon the prosperity of the inhabitants), and though the rest of the plain is treeless, the effect produced on the eye of any one standing in its centre, by the grouping of the villages, is that of an unbroken forest. The difficulties of map-making in the Great Plain are further enhanced by the yearly changes in the river-beds and in the distribution of the water. What are lakes one year are dry land the next, and *vice versâ*. Take the most recent case of the Hün Ho. Prior to 1896 it joined the Pei Ho at Tientsin; now its former bed is dry, and it joins the same river 10 miles higher up. A comparison of the War Office map of Tientsin District, 1 inch to 1 mile, with any map existing prior to 1901, will demonstrate the extent to which these remarks apply.

Other difficulties with which scientific exploration and survey work in China have to contend are the ever-present crowds of people—not, as a rule, boisterous or threatening, but merely inquisitive, anxious to acquire information. Then payments must be made personally, and not through servants. The awkward currency necessitates money being carried by the hundredweight, and much labour in arithmetical calculations. This trouble is, however, abating, thanks to the new 10-cash copper coins, silver dollars, and paper money, which each province is turning out wholesale, and which find a ready circulation. Lastly, there is the prodigal disregard of the value of time, which greatly retards progression in a hundred different ways.

McAndrew and Kirkpatrick's Journey in Outer Chih-li and down Yellow River.

Before quitting the subject of the first part of this paper, I wish to refer to a journey accomplished in 1905 by two British officers (Major G. B. McAndrew, Lincolnshire Regiment, and Captain Kirkpatrick, R.A.) when proceeding on a shooting expedition to the Alashan mountains. I had hoped Major McAndrew would himself have been able to read a paper, but he was obliged to leave suddenly for South Africa, and thus we have been deprived of an interesting record. Although the journey was made only last year, I believe I am correct in stating that these two travellers were the first British subjects to follow the course of the Huang Ho from Pao-t'ou to T'ung-kuan-T'ing, a distance of roughly 556 miles. Though several travellers have crossed

it, McAndrew and Kirkpatrick would have been the first foreigners of any nationality to have accomplished this journey, but that the year previously (1904), two German officers, Lieut. von Mutius and Captain Count von Magnes, had, I believe, come down the same section of the river in a boat as far as T'ung-kuan. They were the first foreigners to traverse this river in its great north and south bend. Lieut. Campbell, R.A., crossed it at Wu-pao on a journey from Peking to India in 1904, and Colonel Bruce crossed it at about the same place on his recent journey in the opposite direction. McAndrew's route-traverse is the first foreign survey of this length of the river, and, added to the work of Indian surveyors who accompanied Nathan, Hunter, Webster, and others during recent years, we have now a complete and fairly accurate chart of this much-discussed and not very well-known river from Pao-t'ou to the sea. The late Captain Watts-Jones, R.E., had he been spared, would have supplied us with the missing sections from Ning-hsia; but after his companion had been drowned by the collapse of their raft, he himself was cruelly done to death in 1900 at Kuei-hua-ch'eng. I do not think the German officers referred to published an account of their journey, which is much to be regretted. McAndrew and Kirkpatrick were also, I believe, the first foreigners to shoot the famous (from a Chinese point of view) and dangerous rapids at San-men, east of T'ung-kuan, up which no boats can proceed.

The route they traversed was—

	Miles.	Days.	Rate per day.
Peking to Kalgan, by cart	110	5	22
Kalgan to Kuei-hua-ch'eng, by cart	191	12	16
Kuei-hua-ch'eng to Hsiao-na-ling (in the Pei Shan) and back	124	6	21
Kuei-hua-ch'eng to Palsy Bulong (Pa-tzu-pu-lün)	182	7	26
Palsy Bulong to Pao-t'ou	62½	3	20
Pao-t'ou to Ho-k'ou	73	3	24
Ho-k'ou to T'ung-kuan	483	20	24
T'ung-kuan to Mêng Hsien	247	14	17½
Total	1472½	70	20 to 21

The Huang Ho, or Yellow river—the "Red Queen" of the Mongols—was followed from a point 80 miles above Pao-t'ou to Mêng Hsien, a total distance of 880 miles, the whole of which (with the exception of a stretch of a few miles between Ho-k'ou and Pao-tê-chên) was mapped on a scale of 1 mile to an inch.

In May, in the ravines of the Maniula hills, the travellers noticed a yellow rose with strong perfume, blossoming in great profusion. This must be a very hardy plant to blossom so soon after the severe winter of Mongolia. It might do well at home in the bleak districts of Scotland.

An interesting point is the curious action of the wind-driven sand

on the sides of the cliffs against which it is blown. It seems to find a soft place, and makes a kind of bed or pit. An eddy is thus created, with the result that deep holes—in places, regular caves—are excavated in the rocks, much like the pot-holes of the Yangtzu river.

The K'ou-wai, the part of Southern Mongolia which the party traversed from Kalgan to Kuei-hua-ch'eng, is a land of dead rivers and dying lakes. "In May, 1905," McAndrew states, "all the lakes shown on the map near the outer Kalgan to Kuei-hua-ch'eng road had dried up. Angul Nor, Kir Nor, T'ai Ha Nor, hold no water, and the streams that used to feed Kir Nor are also dry."

In June, 1902, Mr. C. W. Campbell described the Lake Angul Nor, the largest sheet of water in the Chakkar country, thus: "In 1889, I

VIEW OF THE FAMOUS MONGOL MECCA, WU-T'AI SHAN, IN SHAN-HSI PROVINCE.

launched a Berthon on this lake. I rowed across it from north to south, and found no greater depth than 4½ feet. The Khara-usu river in June to July, 1899, was a mere trickle of water. In June, 1902, it was a series of shallow pools." Thus, on the chart given to McAndrew and Kirkpatrick, Angul Nor was shown as it was drawn by the Indian surveyor who accompanied Mr. Campbell in 1902—as a large sheet of water. In 1904, Mr. Larsen informed me that the lake was no more, and the river feeding it completely dried up. This is corroborated by McAndrew, with the additional information that the same fate has overtaken all the other lakes and rivers.

Two reasons are put forward for this drying up of the lakes and rivers. First, the undulating grass lands which prevail in this part of Mongolia being hard and dry, when rain falls it quickly runs off into the watercourses and collects in the lakes. But the invasion of the

Chinese farmer has altered the face of the land, which, being now ploughed up for the crops, drinks up all the water as it falls. Once the soil is broken, it is very porous; hence the lakes, receiving no fresh supplies, gradually dry up, leaving on the surface a white-coloured efflorescent deposit like saltpetre, a sufficient reason for the absence of fish or other living creatures.

The above is the theory of the Protestant missionaries. The Belgian Roman Catholic missionaries have a different one. In their opinion the first reason does not account for the drying up of the springs in the hills and mountains. They affirm that the rainfall has been steadily decreasing since eight or ten years, until latterly there has been practically none at all, so that even the springs are dry.

Perhaps the second theory may be to some extent the result of the first. The absence of surface water over a large area would, I suppose, be likely to reduce the local rainfall to some extent.

The hills through which the Yellow river passes are monotonous carboniferous sandstone, with loess on the top. They are bare and treeless, the charcoal-burner quickly demolishing whatever is growing. The jujube plum and mulberry are cultivated in the valley bottoms and level spots. Patches of tamarisk scrub—like the "jow" on the banks of the Ganges—and a stunted broom with yellow flower were seen along the banks. The Mongolian grass country, which in summer is a mass of flowers, was quite bare. West of Kuei-hua ch'eng, in May, the dwarf purple iris, 4 inches high, growing in compact clumps, made a fine show.

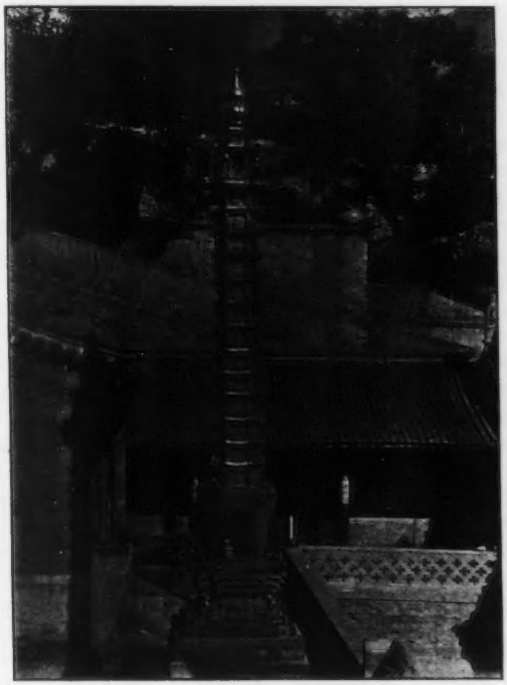
The travellers did not get any shooting to speak of, owing to lack of time to remain long enough in any one locality. The *huang-yang* (the yellow antelope) was seen everywhere in Mongolia, in herds of six to twenty, often grazing among the sheep and cattle. The *Ovis argili* (pai-yang) are in fair numbers in the hills north of the Kuei-hua-ch'eng, but they are being fast thinned by the Chinese colonists. A herd which numbered a hundred only a few years ago is now thirty. *Roe deer* (p'ao-tzu) are very common on the hills north of Kuei-hua. This deer, which in England is associated with woods and thickets, is found here on bare lonely hills. The *red deer:* there are some in the Muniula hills, where the Mongols jealously guard them, killing a few each year for the horns in velvet, which are valuable for medicinal purposes. The *wild goat* (shan-yang): a few in the Maniula hills. They are dark brown colour, with massive horns. *Wolves* are common in Shan-hsi and Shen-hsi, along the Yellow river.

Great numbers of *small rodents* are found in the grass country of Mongolia. The commonest is a rat with a yellow hairy tail, the huang-shu (*Cricetus fumentarius*); it is considered a delicacy by Chinese gourmets.

Wildfowl abound in the pools and rivers, specially the grey goose

in immense numbers. Partridges, sand-grouse, pheasants, and a few snipe were seen at various points along the route, also numerous wild pigeons (blue rocks).

A good many snakes were seen on the banks of the Huang Ho. Longest, 3 feet 6 inches; backs, light green; bellies pale yellow; ditto under head, which is V-shaped; small hood; erectile fangs; bodies narrow suddenly near the end of tails; crimson splashes each side of head. One had six frogs in its stomach; it had also five of its own



GOLDEN PAGODA IN TEMPLE AT WU-T'AI SHAN.

eggs, joined together by a kind of string, each egg about the size of a robin's.

The Chinese are very fond of the Lung-men for its rocky scenery. Rapids are frequent from 30 miles below Pao-tê-chon until Yu-ming-k'ou. The greatest depth obtained was 18 feet, but there are probably many deeper places. The temperature of the water was 71° Fahr. on June 19. The speed of the current varies greatly, in some places where deep and smooth, flowing at 6 miles an hour. A little further,

and it may slow down to a mile an hour. In short, this section of the river has some of the characteristics of the Yang-tze gorges. According to the Chinese boatmen, the three most dangerous places are the Lung-wang waterfall, the Yu-ming-k'ou narrows, and the San-men rapids.

At Hu-k'ou, one day's journey north of the narrows of Lung-men, and 250 miles below Pao-tê-chen, is the Lung-wang (Dragon Prince) waterfall, which was discovered (for the foreign geographer, at all events) by McAndrew and party. Here this immense volume of tawny-coloured water plunges down some 30 to 40 feet in a narrow deep crevasse; the falls are hidden in the clouds of spray. The boats are dragged round with great difficulty overland for about 1200 yards. Major McAndrew thus describes this interesting locality—

"The scenery down the Yellow river from Ho-k'ou to Yu-men-k'ou, and again below T'ung-tuan-t'ing, is very fine in places, but also monotonous. The hills are all bare, of uniform height, and topped with a smooth cap of loess. The cliffs that line the river are all about the same height, and of the same reddish-grey sandstone. There are, however, a few spots that are well worth a visit. One of these is the Lung-wang (the Dragon Prince) waterfall. Above the fall the river is about 200 yards wide, and the channel is broken up by rocky ledges. The bulk of the water, a tumbling mass of a tawny orange colour, flecked with foam, plunges into a narrow crack in its bed near the Shen-hsi shore. The depth of the fall is about 40 feet, but the bottom is a seething cauldron which cannot properly be seen owing to the clouds of spray that rise from it. The remainder of the water falls into the same fissure at right angles to the main fall in a series of cascades 500 yards long. This is a region of wonders and paradoxes. There is a spot some distance below the fall where, standing on the roadway by the river-bank and looking up-stream, one sees a cloud of blue smoke rising from the middle of the water without apparent cause, while at one's feet the whole volume of a great river rushes for 9 li (3 miles) down a narrow fissure in places not more than 15 yards, and nowhere more than 40 yards, wide. One can, I say, stand and see, but one cannot in June (the time of our visit) conveniently sit on the rocks by the side of the roadway, because they have been baked burning hot by the rays of a powerful sun, and one cannot sit on the roadway itself, because it is a mass of ice 12 feet thick. The presence of this ice in midsummer so far south comes on one as a great surprise. The sun heat in this gorge is intense, and the water of the Yellow river itself 71° Fahr. Yet there are great banks of ice on the rocky ledges at the side of the water. One of these on June 20 was 100 yards long, 5 yards wide, and 12 feet thick. This ice, I believe, generally melts away by the end of July, and long before June gets so covered up by dirt and dust, that one does not realize at first that it is ice, but by cutting into it clear blocks can be got. When the ice breaks up in spring it floats down,

and is carried away over the falls, and gets jammed in the narrow fissure below. The force of the water churns it up on to the banks. The river here must be a grand sight in March, rushing through piles of ice 30 or 40 feet high.

A day's journey below the Dragon King falls is the famous Lung Men gorge, ending in the straits of Yu-men-k'ou. This gorge is about 30 li long. The river is a deep, still stream 150 yards wide, and races between precipices of reddish-grey sandstone 800 feet high. Above the precipices the cone-shaped tops of the hills covered with green scrub rise for another 800 feet. At Yu-men-k'ou the banks contract to 60 yards, and upon each side of the straits there is a fine temple. Coming down-stream, when one's boat rushes through this strait there is a regular transformation scene, the river suddenly leaving the hills and spreading out over a sandy flat to a breadth of 1½ mile. Yu-men-k'ou is justly famous amongst the Chinese, who are great lovers of rock scenery. Another famous spot well worth a visit is San-men. Below the rapids, and until the river leaves the hills above Yeh-shu, there is as fine rock and hill scenery as anywhere along its course."

At San-men, east of T'ung-kuan, the river enters the hills, and rapids occur which form an impassable barrier to ascending traffic (boats reach a point 30 li below the rapids), while considerable danger attends even the descent. At this point the river makes two right-angled bends 150 yards apart. There are two sets of "gates," having three main channels, used in turn according to the water-level of the river. McAndrew failed to attain statistics as to the number of accidents, owing to the reluctance the boatmen have of mentioning the subject, which is considered unlucky.

As regards navigability, there is very little through traffic; such boats as do descend are very roughly put together at Wu-pao Hsien, and are broken up at the end of their journey. The chief cargoes are coal and liquorice, the latter from Ning-hsia; forty boat-loads are said to come down annually.

From Yu-men k'ou to T'ung-kuan-T'ing.

The navigation is obstructed by the shifting banks and shallows. There is a large traffic in coal from Shih-chia-t'an to Chuang-wa, transshipped at Yu-men from smaller to larger boats.

Thus for steam navigation the river above Mêng Hsien would appear to be at present quite unsuited. The cost of making locks at the San-men rapids might repay the outlay, as this would open up the waterways to Hsi-an Fu and Lung-men; above this point steam traffic would not pay.

Coal-mines are widely distributed all along this section of the Yellow river, hardly a point more than 60 miles from some coal-working or other, the average cost being 1 cash ($\frac{1}{35}$ of a penny) per chin

(1⅓ lb.). Owing to difficulty of transport, the price rapidly increases with the distance from the mine.

During the journey the temperature ranged from 18° Fahr. on April 22 near Kalgan, to 105° Fahr. in July in tents on the Yellow river bank. Rainfall, water, and fuel are all scarce in the K'ou-wai. A curious feature is that all along the Yellow river from Hei-k'ou to Yu-men, the arable tracks are all on the hilltops, where the loëss is, and the valleys, which are full of rocks, are not cultivated. The people live chiefly on small millet and potatoes, which are grown everywhere. There are some irrigation works being set on foot by the Chinese officials along the northern bend of the Yellow river.

Above Lung-men communication along the river-banks is almost non-existent. This necessitated sending the baggage-mules and riding-ponies by a big *détour*, when McAndrew and party took to boats at Chi-K'ou on June 14. The two parties re-united at P'u-chou Fu on the 31st. The baggage animals covered 1265 li, or about 380 miles; that is, 25 miles a day for seventeen consecutive days, with two halts of one day each. This illustrates the oft-repeated evidence of travellers regarding the capabilities of Chinese men and mules as marchers.

Journeys in Hills west of Peking and to the Wu-t'ai Mountains.

I pass now to that part of my subject relating to recent travels in the mountains west and south-west of Peking.

My remarks fall naturally into two divisions. The first deals with a visit, by previously unsurveyed routes, to the Hsiao (or Lesser) Wu-t'ai Shan; the second, also by previously unsurveyed routes, to the time-honoured Buddhist or Lama shrine of Wu-t'ai Shan (Five-terrace mountain). The object of these travels was to connect up with the work of previous British explorers.

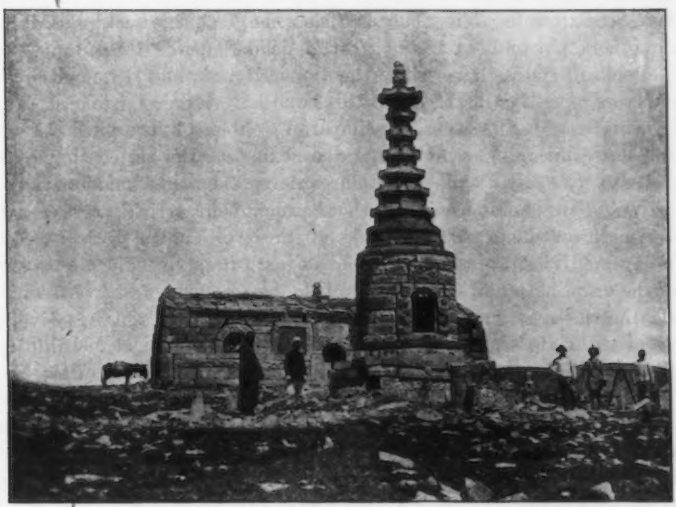
Owing to various causes, it has not been possible to prepare in time a detailed reduction of our survey work in the hills west and south-west of Peking; consequently I have utilized for purposes of illustration the beautiful maps of my American friend and brother explorer, Mr. Bailey Willis, to whom I shall have occasion again to refer. On these maps have been entered rough reductions of the surveys we made on these occasions.

Our small expedition left Tientsin on August 21, 1905, and proceeded by rail to the now famous Hsi Ling, or Imperial Western Tombs. It was the troubles of 1900 which first brought these and so many other important, though little explored, places of interest into prominence. When history is written, what a debt—geographical and otherwise—we shall find owing to those much-abused and misguided patriots, "the Boxers"! To my mind the Chinese conception of an imperial burial-ground is a very grand one, only equalled by the Taj at Agra and the Great Pyramid of Egypt. The latter make up in durability what they

lack in picturesque surroundings, and in natural, as opposed to artificial, grandeur. Cecil Rhodes seems to have been, in some measure, imbued with the Chinese idea, in choosing for his last resting-place the Matoppo hills in South Africa.

The Imperial Tombs east, west, and north of Peking (the first two Manchu, the last-named Ming) have been often described by abler pens than mine. Notably the Tung Ling by Mr. F. H. Bourne in the Royal Geographical Society's *Journal* of 1872.

It is customary for Chinese imperial tombs to face the south, and to be backed by an amphitheatre of hills—whenever possible, steep, broken, and inaccessible. Another peculiarity in regard to both the Tung and



RUINS OF ANCIENT TEMPLE ON SUMMIT OF CHUNG-T'AI, 9600 FEET ABOVE SEA-LEVEL.

Hsi Ling (east and west imperial tombs) is that the Great Wall (or branches of it), for the length where it follows the crest of the hills behind the tombs, has been demolished, presumably so as not to interfere with the Feng-shui of the departed spirits. Though, since 1900, the Hsi Ling has become a popular resort for tourists and holiday makers (as well as for sportsmen who pick up a few pheasants there), few have visited the Tung Ling.

The future burial-places of their Imperial Majesties, the present Emperor and the Dowager-Empress of China, are interesting. The site of the last resting-place of the present emperor lies in the north-east corner of the Hsi Ling. At the time of our visit work on it had not yet commenced. The Dowager-Empress has had a very fine mausoleum

prepared in the Tung Ling, alongside her late consort, Hsien-fêng, and near her great ancestors, K'ang-hsi and Ch'ien-lung. The well-known custom of preparing a resting-place while yet living is carried to a much greater length in China than it is in this country. The ambition of every Chinese man is to get a son, and a son's earliest act of reverence is to present his father with a coffin. I remember, when travelling in unfrequented parts of Western China, seeing an old man and his wife asleep side by side, each upon a straw-covered coffin with a couple of bricks for pillows.

The country we are about to enter is of considerable interest geographically, geologically, and religiously; this will be readily admitted when we recall the names of some of the distinguished travellers who have been attracted to it—such as Richthofen, Potanin, Rockhill, Edkins, and others, not to mention the great Manchu Emperor Ch'ien-lung.

Rockhill states that "since the Imperial visit of 1786, none of the emperors have been here." But this must have been a mistake, because I have in my possession the imperial route-book compiled for the Emperor Chia-ching, who visited the shrine in the sixteenth year of his reign (A.D. 1812). The last foreigners, other than missionaries, to visit Wu-t'ai Shan and neighbourhood prior to our arrival, were a party of Americans under the direction of the well-known geologist, Mr. Bailey-Willis, sent out by the Carnegie Institute of Washington to take up the examination of the geology of the eastern side of Shan-hsi which Richthofen began, much as the German explorer, Dr. Tafel, has devoted his attention to the western side. I am indebted to Mr. Willis for advance proof copies of the maps he produced. As a sample of the kind of work which a small scientifically equipped party with a well-furnished banking account can accomplish, these sheets are noteworthy. I was glad to be able to render some assistance to the Bailey-Willis expedition, by which they picked up and carried on the triangulation which Major Renny-Tailyour and Captain Ryder had made during the operations of 1900–1901. Their surveys were executed with plane-table and alidade.

Leaving the hospitable shelter of the lama temple at the western tombs early on August 22, we wandered through the beautiful parks surrounding the last resting-place of the Emperor Tao Kuang and his somewhat numerous consorts, and were soon ascending a long valley bounded on its northern side by a precipitous, inaccessible granite cliff of that fantastic appearance dear to the Chinese artistic mind, as is well depicted in their numerous drawings and ornamental gardens. These cliffs and curiously shaped peaks are a feature of the hill-country west and south-west of Peking recently described by Mr. E. C. Young in this Society's *Journal*. A few months earlier I had visited this little-known region (marked blank on all the published maps) *en route* to the Hsiao (or Lesser) Wu-t'ai Shan, and I can thus corroborate all that Mr.

Young says, especially as to the terrible fatigue engendered by having to follow river-beds filled with rounded stones of every dimension, from shingle to enormous boulders, which the character of the hills and the absence of all roads make a necessary evil. Here and there, above high-water mark, maybe a pathway exists, but, as each freshet descends, any slight evenness which the traffic may have worn along the river-bed is soon obliterated. Moreover, the limited range of view, and the necessity whenever a hill is ascended of again descending to the valley bottom, make surveying difficult and protracted. This remark applies equally to survey work in the loëss formation. So far as I can ascertain from published accounts, I must have been the second British subject to ascend the Lesser Wu-t'ai, the first having been Mr. Savage Landor, who published a description of his journey in the *Fortnightly Review* for September, 1894.

This is the more remarkable because this mountain is only 75 miles as the crow flies, or seven or eight days' march from Peking. Moreover, it is, with the exception of its no higher, but more celebrated sister further south, the highest mountain in the Chinese Empire between long. 108° and 127° E. Dr. von Möllendorff, the first foreigner to ascend the Lesser Wu-t'ai in 1873, determined the height of the Pei Ting, or Northern peak, to be 3491 metres, or 11,450 feet above sea-level.

This is some 1400 feet above Richthofen's and Rockhill's heights for the Greater Wu-t'ai, and from my own observations I am inclined to think that Möllendorff overestimated the height. I approached the mountain by an unsurveyed route from the south, and ascended the Nan-ting (or south peak), which is slightly lower than the north and central peaks. My observations lead me to conclude that the south peak is about 9600 feet, and the north peak probably 300 feet to 400 feet higher. The shape given to the mountain on Möllendorff's map is substantially correct.

On the day of our visit the mountain was still white with a heavy snowfall, which occurred during the night nine days previously (May 18–19), and extended down to 5000 feet. On that night I was sleeping in the old temple on the summit of Pai-hua Shan (White Flower mountain), 7000 feet (Möllendorff makes it 800 feet higher). This well-known mountain lies in a direct line between the Lesser Wu-t'ai and Peking, from which it can be seen on a clear day. It is often visited by foreigners residing in the capital. I had hoped to get a view of Wu-t'ai and Peking from Pai-hua ; but, to my great disappointment, on reaching the summit, found everything hidden in the impenetrable haze, to which reference has already been made. We could scarcely see the neighbouring hills. At 7 p.m. the thermometer stood at 50°, and the atmosphere was oppressive.

During the night, however, a transformation scene was enacted. The thermometer dropped to 33°, snow fell heavily, and in the morning

we beheld a sight which rewarded us for the cold discomfort of the night, and which only the artist's brush and the poet's pen could have adequately depicted and described. On the one side, a confused mass of yellow-coloured mountains and deep, violet-hued ravines, filled with the morning mist, surmounted by the five snow-capped peaks of Wu-t'ai and neighbouring high mountains. On the opposite side, beyond the surrounding hills, could be clearly seen the great plain of Chih-li, with the walls and minarets of Peking (about 45 miles distant in a bee-line) and the silvery streaks of the Hün and Chü-ma rivers meandering to the far horizon. The photograph here shown gives but an inadequate idea of this magnificent panorama, but is valuable as showing what can be done with a Kodak hand-camera and ordinary rectilinear lens in North China *when* the atmosphere is clear; at other times, owing to the haze, only failure results when trying distant landscape views. Another difficulty in obtaining good photographs of the geographical features of North China is the prevailing yellow hue of the ground and mountains, the latter generally quite bare; this, with a background of clear blue sky, makes, under ordinary conditions of photography, insufficient contrast. I would strongly advise all who wish to obtain good landscape pictures in North China to use colour-filters and orthochromatic plates. This applies equally to most of the imperial palaces, tombs, and temples, owing to the yellow roofs, the reddish-pink walls, and woodwork picked out with blue, green, red, and gold—splendid subjects indeed for colour photography. The distance in a bee-line between Pai-hua and the Lesser Wu-t'ai is between 25 and 30 miles, according to which of the five peaks is chosen, but such is the nature of the country that it takes five days to march it.

These western hills are of great interest to the geologist, owing to the way in which the strata are exposed, affording good opportunities for examination *in situ*. The effect, too, of the torrential rains is marked, and the country is so broken that only fruit can be grown for export. The valleys are sparsely inhabited, the people poor, and the crops only sufficient for local requirements. This applies to the whole belt, until the extremely fertile T'ao-hua valley is reached.

Concerning the Great Wall, I may remark that its position is wrongly shown on the maps of the day in quite a number of places, while in others it has ceased to exist—the only places where it forms a substantial boundary being in the valley bottoms, on the passes, and where it crosses main routes. These remarks apply with particular force to the branch running south-west from the Nan-k'ou pass, and forming the boundary of Chih-li and Shan-hsi provinces.

(To be continued.)

NOTES ON A JOURNEY THROUGH THE WESTERN HIMALAYA.

By T. G. LONGSTAFF, M.A., M.D.

THE following notes deal with portions of Kumaon, Nepal, Tibet, and Garhwal, which I visited in the course of a six months' journey last year (May to October, 1905), the distance covered being about 900 miles on the map. This journey was originally intended to be a purely mountaineering excursion, and I was accompanied by an Alpine guide from Courmayeur, Alexis Brocherel, with his brother Henri as porter.

I have already dealt with the mountaineering aspects of this trip in a previous number (August, 1906) of the *Alpine Journal* (vol. 23, pp. 202–226), to which I shall refer those interested in the subject. A considerable number of photographs of topographical interest were obtained. I estimated my altitudes with a 4½-inch Watkin aneroid by Hicks, which was constantly compared with the altitudes on the G.T.S. maps. In order to diminish the chances of over-estimating my heights, I gave the barometer only half a minute to settle after putting it into gear. In consequence, its readings were almost invariably higher than those shown on the maps, but I have made no allowance for this probable addition to my heights. I had no idea that I should be able to visit Tibet until I had left civilization behind, and was therefore unprovided with instruments and maps which I should otherwise have taken with me.

Leaving Almora on May 14, we proceeded by the usual but very interesting route to the head of the Milam valley, and pitched our camp close to the hamlets of Ganagarh and Pañchu (altitude 11,100 feet) on May 27, our arrangements having been greatly facilitated by the kind help of Mr. C. A. Sherring, I.C.S., the deputy commissioner of Almora, and of Kishen Singh, Rai Bahadur, the Pandit 'A-K' of the trans-frontier survey, whom we met at Mansiari. In the upper Milam valley, the strong wind (*rani ka pankha* of the foothills) which blows daily up the valley is very noticeable, and the general aspect of the country, with its climatic conditions, fauna, and flora, undergo a marked change, and, approximating to those of the neighbouring part of Tibet (Hundes), form an extraordinary contrast to the luxuriance of the semi-tropical region which has just been left behind.

The Bhotias had not yet come up to their summer quarters at Martoli and Milam in any considerable numbers, but we passed a few strings of grain-laden sheep, and ploughing with *jhobus* had just commenced. Though the main valley is practically treeless above Baugdiar (8550 feet), birch trees grow up to about 12,000 feet on the northward-facing slopes of the lateral valleys, while rhododendron thickets extend 1000 feet higher. At Martoli I obtained specimens of the red-billed chough (*Graculus eremita*), which belongs rather to the Tibetan region,

and is not nearly so common here as the Alpine chough (*Pyrrhocorax alpinus*).

Several days were spent on the Pañchu glacier, which is at present, and has been for some time, receding. Flocks of *Colomba leuconota* and *Accontor nepalensis* were seen feeding about the snow-covered moraines up to 15,000 feet. The afternoons were generally cloudy, and there were some light rain and snow falls.

On June 2 we crossed a difficult snow-pass at the head of the Pañchu glacier, directly under the south-eastern ridge of the eastern peak (24,379 feet) of Nanda Devi, its height being 17,750 feet, according to my Watkin aneroid. To our surprise we found ourselves at the head of the Lwanl valley, and not on the Kumaon-Garhwal water-parting as indicated on the G.T.S. maps. This pass, for which I would suggest the name Pañchu, should only be crossed by experienced mountaineers, and no attempt should be made to take native coolies or shikaris over it. After a steep but easy descent, we found ourselves beside the rapidly shrinking glacier which rises below the eastern cliffs of Nanda-Devi (east peak), and descended the Lwanl valley, sleeping in the open some way below the summer grazing-ground of Narspan Patti, and regaining the main valley next day.

I was surprised by hearing the Bhotias use the word *gal* (pron. *gull*) for glacier, the identical word being in use by the Svans of the Western Caucasus.

On June 5 we started to ascend the Lwanl valley again to its head, making frequent use of great beds of winter avalanche snow, which completely covered the stream in many places, and gave an easy route up the glen for long distances. On June 8 we reached the Kumaon-Garhwal water-parting at 19,000 feet (Watkin), the last two days entailing climbing too difficult for the coolies (*vide Alpine Journal, loc. cit.*). From this point we looked (west) down upon the glaciers at the base of Nanda Devi, and (south) over the Pindri ridge and Traill's pass, which, tradition says, was regularly used long ago, to the Pindri glaciers, from which the Pindar river takes its origin. Next day we tried the south ridge of the east peak of Nanda Devi, but found it would take us at least two days more, for which we had insufficient food.

On June 10–11 we attempted to climb Nanda Kot from the summer grazing-ground of Narspan Patti (Schlagintweit, 13,404 feet; Watkin aneroid, 13,150 feet), but had to turn back at about 21,000 feet, owing to the danger of starting an avalanche.

On June 15 we started up the S'halung glen, which forms the south arm of the Lwanl valley, and on the 18th crossed a difficult pass (18,000 feet, Watkin), for which I suggest the name Ponting, in 18½ hours, being again without coolies. The Ponting glacier, on to which we descended, is crossed by three ranges of cliffs, the two lower of which completely

interrupt it, except for a chaotic ice-fall. None of them are shown on the maps. The glacier is advancing, and its snout (11,600 feet, Watkin) presents a beautiful sight, the clear green ice being raised above the upper edge of the lateral and terminal moraines, and showing no tendency to lower its bed. At this spot I saw a mouse-hare (*ochotona*). This genus is widely distributed through the mountains of Kumaon, Nepal, Tibet, and Garhwal. I obtained specimens in the two latter regions, probably of different species, though the point has not yet been determined. For half a mile below the present termination of the glacier the ground is littered with huge boulders and grassy heaps of moraine stuff, amongst which are groves of rhododendron, birch, and pine, forming a delightful change to the treeless glens in which we had spent the last four weeks.

We reached our camp, which had been sent down to Bangdiar by the main valley, on June 19. Sherring having obtained leave for me to accompany him on his mission to Tibet, we proceeded back through the middle and tropical zones of the lower Gori to Askot, where we joined him on June 27.

Following the track along the right bank of the Kali river, which forms the frontier between Kumaon and Nepal, we reached Garbyang on July 8, having made the distance in eight marches. On July 3, at Tithla, I shot a pair of black-and-yellow grosbeaks out of a small flock in the forest of silver fir there, and am interested to find, on inquiring at the Natural History Museum, that the male was *Pycnorhampus affinis*, while the female was *P. Icteroides*, an interesting case of closely allied species frequenting the same ground, this being about the eastern and western limits of the two species respectively.

On July 9 I visited the Nampa glaciers (roughly indicated in Sheet 37 of the G.T.S., 1 inch = 1 mile), in search of Landor's Lumpa peak, 23,490 feet (*vide* Landor's 'Tibet and Nepal,' chaps. viii. and ix.). Sherring obtained for me two of the four Bhotia coolies who accompanied Landor on this trip, and I took seven others, in order that we might travel as fast as possible, our time being so limited.

Crossing the Kali just above Garbyang, we entered Nepalese territory, and soon came to the Tinker stream, which we crossed close to its junction with the Nampa stream. Crossing this also, we travelled along its left bank through beautiful woods of *Pinus excelsa*, and then over meadows of blue clover and red-blossomed strawberry to the glaciers. These are almost completely covered by surface moraine in the lower portion of their course, and are of great size, though the length of the main ice-stream does not now exceed 5 miles. Two large glaciers, about 4 miles long, separated by a high ridge, flow due north from Nampa peak into the main valley, but do not now join the main ice-stream. The lowest comes down to about 12,500 feet (Watkin), and presents the curious spectacle of having a split tongue. The first

tongue, or snout, is stone covered; then comes a very old moraine area piled up about 100 feet, and dotted over with large silver birches. This is succeeded by the second snout at a considerable level above the first, and which I almost mistook for a separate glacier. I can only explain the formation by supposing that after the old terminal moraine was formed, the glacier began to advance again, and that the advancing snout of the glacier, far from removing the obstruction, was split into two tongues by the wedge-like opposition of the moraine, which was sufficient to keep the eastern arm at an elevation of at least 100 feet above that of the lower or western.

On July 10 we continued on up the main glacier to Landor's highest camping-place (13,200 feet, Landor; 12,680 feet, Watkin). Leaving this camp sometime after 5 a.m., he states (*op. cit.*) that he ascended a peak of 23,490 feet, returning to the same camp at 6 p.m. Leaving most of our impedimenta here, we pushed on with Linka and Gobria, the two Bhotias previously mentioned, and reached the cairns he had erected in 1899. Having damaged my barometer at 15,300 feet, I am unable to do more than guess at the altitude, but believe it to be about 16,500 feet. I found no peak of 23,000 feet in the position indicated by Landor, and Nampa (23,352 feet) lies considerably to the south-west of his route. We returned as rapidly as possible by the same route, and reached Garbyang again on July 11.

Entering Tibet on July 14, in company with Sherring's party, by the easy Lipu Lekh (16,780 feet), we proceeded through Pala and Magram to Taklakot. According to Rawling ('The Great Plateau,' p 251), ours was the third European visit to this place; but, unlike our predecessors, we met with a most friendly reception. Taklakot (Purang) is the largest village in Hundes (Nari-khorsum), and at least equals, if it does not surpass, in importance the summer camp at Gyanema as a trade centre with British India. There are some poplars at Magram—the only trees I saw in Tibet. The altitude of Taklakot is given as 13,300 feet in the maps. The camping-ground is warm and sheltered. On July 16 the shade temperature was 76° Fahr. at 2 p.m., and 54° at 11 p.m. In the neighbouring *rongs* are several considerable hamlets, but Sherring has dealt with this district in his recently published 'Western Tibet and the British Borderland.'

I left Taklakot on July 18 with the two Brocherels and six Byans Bhotias to examine the western flanks of Gurla Mandhata (Memo-Nam-Nyimri of the G.T.S., Momo-nangli of Strachey, or Nimo-Numgyl of local Tibetans). The altitude of the culminating point is 25,350 feet according to the G.T.S. As long ago as 1864, Webber ('Forests of Upper India,' 1902) noted that the ascent of this peak would probably prove easier than that of any strictly Himalayan peak of an equal altitude, owing to the very high snow-line prevailing in this part of Tibet.

Crossing the Karnali by a good wooden bridge above the big bend which this river makes to the east of Taklakot, we passed through the hamlet of De-la-ling, leaving the tomb of Zarawar Singh on the left. Soon afterwards we crossed the shallow stream of clear water which descends from the first and most southern gorge of the Gurla *massif*.

This gorge runs roughly from east to west, and is bounded on the north by the ridge which culminates in the G.T.S. peak, 22,200 feet. We met a large caravan of Tibetans, with many sheep and laden yaks, evidently bound for the wool market at Taklakot. Turning sharply to the east, we walked along the raised bank of the stream towards the foot of the ridge just mentioned. This raised bank bears a faint resemblance to an ancient moraine, and in the wide torrent bed are scattered large angular boulders, which looked from a distance as if they had been left there by a retreating glacier. We afterwards looked down upon the whole extent of this steep-sided stony gorge. At its head is a relatively low *col*, with snow-streaked peaks springing up from it to the north and south, and other snow-streaked peaks rising into view beyond it to the east. No glacier was visible at the head of the gorge, and the *col* appeared to form a true water-parting.

Commencing the ascent of the ridge itself at noon, we climbed steadily up steep but easy stone slopes for nearly six hours, and, sending the coolies down, camped for the night near the first beds of snow. The height of Bal-Dak is given in the G.T.S. as 15,000 feet, and we were higher than this at noon; considering, also, the complete absence of all vegetation, and size and character of the snow-beds on this south-west slope, I think that our altitude must have been over 18,000 feet.

The weather was cloudy on July 19, and I was suffering from headache, so we passed the day here. My barometer having been broken, and Sherring's hypsometer not being graduated low enough for use at these altitudes, I took the opportunity of tea-making to boil an air-thermometer. By plunging the bulb into the boiling water I got the mercury to oscillate between 169° and 170° Fahr., which, of course, gives a hopeless result (almost 23,000 feet). The air temperature (11 a.m.) was 45° Fahr., the sky being overcast and the sun quite concealed. The observation was comparable to the classical example at Pike's Peak observatory, when a pan of loose snow was set on a hot stove to melt, and in a short time the water in the bottom of the pan began to boil, while the snow on the top of it was yet 3 or 4 inches deep. Again, on July 22 the temperature of a kettle of boiling snow-water at about 20,000 feet was only 165° Fahr., a result which was equally worthless for scientific as for culinary purposes.

This day (July 19) the Himalaya of Nepal and Kumaon were hidden by the clouds, but the view towards the west was very impressive. Kamet (25,443 feet) stood out boldly over the Niti pass at a distance of 100 miles. North of this was the Gangri range, partially snow-clad on its

north-east slopes. Between lay a vast rolling plain, with rounded snowless hills rising from it, and a bend of the infant Satlej winding away into the north-west on its way to the Arabian sea, while the waters of the Karnali at our feet were flowing towards the Bay of Bengal.

On July 20 we got off at 2 a.m., in brilliant moonlight, the thermometer registering 29° Fahr. The Himalaya of Nepal were visible long before sunrise, the first to catch the light being a very high and distant snow-peak bearing slightly east of south-east, and which we estimated to be over 25,000 feet in height. On reference to the map, it appears to be Dhaolagiri, distant 180 miles. Soon we saw Rakas Tal to the north, but Mansarowar remained hidden by the great western shoulder of Gurla. Passing over a steep dome-shaped snow-peak, we found ourselves on a narrow *arête* of snow, with our first uninterrupted view of the summit of Gurla. Below us was spread another glen, shut in by steep walls, and, like the first one already described, narrowing towards its outlet. The upper half (E) was filled by a large glacier, very white in colour, owing to the almost complete absence of moraine-stuff from its surface. For convenience I shall allude to it as the Gurla glacier. The ridge we were on led to the G.T.S. peak (22,200 feet), and then round in a northerly direction to the summit of Gurla. This route being obviously impracticable, we turned back as soon as a series of photographs (*vide Alpine Journal, loc. cit.*) had been secured.

I should like to put on record that the small map published in this *Journal* for 1900 to illustrate the journeys of the brothers Strachey in 1846–8–9, gives a more correct representation of the Gurla group than that retained in the latest sheets of the G.T.S. trans-frontier series. The huge southern glacier does not exist as shown in the latter. This locality lies well to the south of Major Ryder's recent survey; in fact, we were the first to see this side of the mountain, though the northern glaciers are plainly visible from the neighbourhood of Mansarowar lake.

Our next camp was made under an accommodating rock beside the stream flowing from the Gurla glacier, and close to an old lateral moraine, which extends into the open plain below the very constricted mouth of the gorge by which this stream leaves the mountains. Indeed, we found here a very good example of the relatively protective, rather than the destructive, action of a glacier, for the stream had cut deeply through a rocky barrier which had long resisted the action of moving ice.

We next (July 22–23) ascended the great western ridge of Gurla to a height of about 23,000 feet, looking down on to and over the G.T.S. peak, 22,200 feet. This route proving too long and exposed (*vide Alpine Journal, loc. cit.*), we tried to follow up the Gurla glacier and the south-west face of the mountain, but after spending two nights in the open at very high altitudes, the continual exposure and want of food compelled me to give up the attempt.

During our descent of the Gurla glacier on July 25, we found that the dry glacier was too rough to follow, apparently owing to surface evaporation caused by the extreme dryness of the atmosphere. For the same cause the glacier stream itself is a very small one. A similar condition has been noted by Freshfield and Mumm on Ruwenzori. The snout of the glacier shows signs of actual recession at the present time. There were several beds of dead ice protected by moraine-stuff below the snout, and these were succeeded by typical glacial pools. Unfortunately, all the plants I collected during this excursion were lost. Of the animals, burrhel (*Ovis nahura*) ranged up to and above the snow-line. One mouse-hare (*Ochotona*, ? sp.) was seen about 17,000 feet. Woolly hares (*Lepus oiostolus*) were common on the lower slopes of the peak, where there were also a few small colonies of marmots (? sp.). On the plain, about Pal-dak (15,000 feet) were a few kiang and goa (*Gazella picticaudata*). I also saw two black wolves (Tib. *Hakpo-chanko*).

Rejoining Sherring on July 29 at the south-west corner of Mansarowar (Mo-bang), we marched the next day along the neck of land which separates this lake from that of Rakas (La-gang), and camped on the shingle beach below Jiu Gom-pa, having crossed the partially dry, but deeply cut, connecting channel at the hot springs. The east end of the channel was closed by a raised bank of shingle, apparently due to wave-action, although there are signs, especially on the low cliffs at the north-west corner, that the level of the lake has fallen in recent times. Sherring obtained an excellent panoramic photograph showing portions of both lakes and the whole length of the connecting channel; an enlargement of this is now hanging in the Society's Map Room.

I accompanied him on his road to Gartok, past the beautiful peak of Kailas, and as far as Missar, following the route recently described by Rawling, and traversed in part by Moorcroft and Hyder Hearsey in 1812. Woolly hares, mouse-hares, ground-choughs (*Podoces humilis*), a small flattish sandy-coloured lizard, and a locust (*Bryodema inda vel sp. n.*), whose appearance when flying curiously resembles that of *Vanessa antiopa*, were the commonest forms of animal life, while kyang and goa were occasionally seen. I also obtained here a pair of sand-plovers (*Ochthodromus pyrrhothorax*, Sharpe), with nestling. The plains were covered with a low growth of *dama* (*Caragana pygmæa*), which with yak droppings formed the only fuel we ever obtained in Tibet.

From Missar I turned off to Tirthapurri, on the Satlej, the ground between the two places being often completely covered with a plant indistinguishable from the *edelweiss* of the Alps. There are some hot springs of great repute at the latter place, which have formed well-defined encrusted terraces near the river. An indescribably filthy monastery, some shrines, and *mendongs* were shown me, said to be the goal of many pilgrims, both Buddhist and Hindu.

On August 7 we forded the Satlej half a mile above Tirthapurri, and, making two long and difficult marches through the almost waterless hills of Chitumb, reached Gyanema late at night on August 8. The fair was in full swing, and a great trade in wool was going on. Owing to illness, probably caused by bad water, I was confined to my tent for a week, and afterwards had to give up walking and ride a yak, so that my opportunities of examining the neighbourhood were very limited. The lake is smaller than at the time of the Stracheys' visits, and its western end is surrounded by soft mud flats, on which were a few ducks and waders. I visited what I supposed were the ruins of the "fort," on a small hill between the Tibetan and Bhotia camps, but found only some ruinous *chortens* and *mendongs*. The Tibetans were quite friendly, and supplied me with yaks to continue the journey.

Leaving Gyanema on August 18, we reached Shibchilam on August 20, the three days' march being across an almost level shingly plain covered with clumps of *dama* about a foot high. Strachey's comparison of this plain to a vast lake is singularly apt, the mirage assisting in the delusion. On the way we forded the Darma Yankti, Gan Yankti, and Chu-Naku, all rapid glacier streams with only slightly sunken beds. The former is undoubtedly, as Sir Henry Strachey suggested in 1846, the longest branch of the headwaters of the Satlej, while the three streams which combine to form the Chu-Kar must carry a greater volume of water than the Satlej where I forded it at Tirthapurri. Gurla was the most prominent object in view, but the Himalaya to the south were constantly visible. The weather was very clear and often oppressively hot, and the daily southerly wind and dust devils were trying. Each evening as the sun set, diverging rays of bright pink light shot up into the eastern sky; gradually the dark shadow of the earth—clearly visible at first, but soon becoming indistinct—crept up and blotted out this beautiful sight.

Shibchilam lies in a deep gorge on the left bank of the Tok-pu. The sections consist entirely of coarse gravel, with rounded and subangular stones embedded in it. Both Tibetans and Niti Bhotias were in camp here. The Dzong-pon of Daba paid me a visit and arranged for a relay of yaks.

On August 22 we made our last march across the plain, which is, however, deeply scored by numerous steep-sided gravelly ravines, all trending towards the Satlej. The present rainfall is obviously insufficient to have cut them out, and we have here another piece of evidence of the increasing dryness of the climate, though we had the unusual experience of a sleet-storm at starting, and flowers and grass were becoming more common amongst the everlasting *dama* as we reached the Dakkar hills. We had much trouble with the new yaks, which were constantly casting their loads and breaking away, and the day's march of about 9 miles occupied seven hours.

August 23 was spent at Dakkar to collect yaks from another herd. Now that we were actually in the hills the wind was worse than ever. Nevertheless, sulphur-yellow butterflies and the common Tibetan locust (*Bryodema inda, vel sp. n.*), with an unnamed wingless species (? near *Atazius*), were common. I also shot one of a pair of warblers (*P. affinis*), and tried in vain to get near a dark-coloured tern that was hawking over the small stream.

Dakkar is surrounded by hills with strangely contorted pinnacles of red rock protruding from their sides. On August 24, accompanied now by only two Tibetans and two Garhwalis, we made a short march south-west into the "Red Hills," getting a view of Kamet on the way, and camped in a wild windy glen. This is a noted region for *Ovis ammon* (*Hodgsoni*), but except for two skulls we saw no signs of them. On August 25 we made our last march in Tibet. Leaving our lonely camp, we continued along a narrow ravine in a south-south-west direction, and crossed a high grassy ridge at an altitude of about 17,000 feet. Below us, to the west, was spread another great plain, similar to that we had already traversed, and across which lies the route from the Niti pass to Daba. A very steep descent led down to a broad but shallow stream, here flowing west. This spot is called Sag, and here we saw the last Kyang, and also a pair of terns, which seemed strangely out of place. We turned nearly due south up a side stream, the valley getting rapidly narrower, with steep bare stony sides. On the way several beds of permanent ice (*dar*) were crossed, through one of which the yaks passed by a natural tunnel. I attribute them to avalanches of winter snow, which remain unmelted year after year, partly owing to the protection afforded by the stones and shale which cover their surface, and partly to the narrow and sunless character of the gorges in which they lie. The sky, too, is generally more cloudy and overcast here as the Himalayan chain is approached, and neither is the heat of the sun nor the dryness of the air so extreme as it is further north and east. Sir Richard Strachey has noted similar accumulations in Pangong and Rupshu (*Journal R.G.S.*, vol. 23, p. 54). After a very long march, we crossed the Shelshel pass (16,300 feet) into Garhwal and camped at Hoti, having completed a journey of about 300 miles in this interesting, if much-visited, corner of Tibet, where for six weeks we had seldom been at a lower altitude than 15,000 feet. In taking leave of Tibet, I cannot refrain from recording my appreciation of the various accounts of this region which we have received from the Stracheys. Their narratives of sixty years ago constitute a record of the country and the people which is still unsurpassed.

This small corner of Garhwal, although to the south of the true Himalayan water-parting, is still Tibetan in character, though the grass is much more luxuriant. The Shelshel pass is relatively low, and the snowy range lies still to the south and west. But the whole of the

Hoti, Laptal, and Topi-dunga valleys are cut off by the narrow and extremely difficult defile of the Girthi river, and remain uninhabited. I saw no trees until we had crossed the Chorhoti pass (18,500 feet) on August 28. Marmots, of which we shot and ate several specimens, are very numerous here. I never saw them in any other locality of Kumaon or Garhwal, though they are reported to be found as far south as Trisul. .

We now followed the course of the Dhaoli river, amongst what is perhaps the wildest scenery to be met with in the Himalaya, to Tapoban. Whether one tries to enter the higher ranges by the valley of the Kali, the Gori, or the Dhaoli, geographically the three chief rivers of these mountains, a zone of profound narrow and precipitous defiles is encountered, which separates the middle ranges from the more open and gently graded upper valleys into which the glaciers discharge. But of the three, the most savage and picturesque are those defiles of the Dhaoli on either side of Malari. At Tapoban we struck up over the middle ranges to Gwaldam.

Leaving Gwaldam on September 26, we reached the foot of the Kurumtoli glacier on October 1, after five hard marches, the distance as the crow flies being less than 19 miles. Our camping-place was called Mulkhet by the Garhwalis; they apply the name Kurumtoli to a grazing-ground and glacier on the western slopes of Trisul. Nevertheless, the nomenclature of the G.T.S. must be respected.

We explored this glacier on October 2–3, believing that it would lead us to the highest peak of Trisul (23,406 feet). We found, however, that a continuous line of cliffs runs due west from A 28 (22,490 feet) to the middle peak of Trisul, and that the water-parting between the Rishi Gunga and the Pindar river is displaced about 2 miles to the north on the G.T.S. maps. The glacier which is shown flowing into the Kurumtoli from the east does not enter this valley at all, but whether it flows north into the valley of the Rishi Ganga, or south-east into the Sukeram glacier, I could not see. I trust it will be realized that I speak of the work of the Indian Survey in no critical mood. With the funds at their disposal, it has been quite impossible to survey the glacier regions with any approach to detail, and it is surprising that so great a degree of accuracy has been obtained in regions so difficult of access, and which are of no importance for political or revenue purposes.

From my kind host at Gwaldam, Mr. Robert Nash, who has been many years in Garhwal, I learnt of an old pass directly to the west of Trisul, which was many years ago frequently used. Colonel E. Smyth, who selected the late Nain Singh, C.I.E., and Kishen Singh, Rai Bahadur, for the trans-frontier survey, speaks of a pass from Ralam in Johar, into the Darma valley, which he crossed with great difficulty, and which was, according to Bhotia tradition, long ago easy of passage. I have mentioned the similar case of Traill's pass over the Pindri ridge. Such

cases may be due merely to local changes in these particular glaciers, but one cannot help remembering the evidence brought forward by Blanford, Garwood, and others to the effect that the Himalaya are still undergoing a process of elevation. Such elevation, by arresting an increasing amount of the monsoon water-vapour, would surely be at least a contributory cause in the desiccation now taking place in Central Asia, indications of which are evident even in regions so close to the Himalaya as Mansarowar.

In concluding these notes, I must express my gratitude to my two Italian companions, who served me well and uncomplainingly during a long journey, which was not without a good deal of hardship and sometimes danger, and of whose technical abilities I cannot speak too highly.

NOTES ON THE WORK OF THE FRENCH GEODETIC EXPEDITION TO MEASURE THE QUITO ARC.

In 1898 the International Geodetic Conference passed a resolution that steps should be taken to remeasure the arc of meridian at the equator, which was first measured in the eighteenth century by Bouguer, La Condamine, etc. The French representatives at this conference accepted the responsibility of undertaking this, and the duty was assigned to the geodetic section of the *Service Geographique de l'Armée*, of which General Bassot, member of the Institut, was director, Commandant Bourgeois of the Artillery being head of the geodetic section. The first detachment of geodesists, Captain Maurain of the Engineers and Captain Lacombe of the Artillery, landed at Guayaquil in 1899. They were instructed to make a general reconnaissance of the mountain chain, and prepare the way for the rest of the expedition.

In 1900 Commandant Bourgeois, accompanied by Captain Lallemand and Lieut. Perrier, both of the Artillery, with the physician attached to the expedition, Dr. Rivet, *médecin aide major*, arrived at Guayquil. They at once proceeded to measure a base at Riobamba, and to determine the difference in longitude between Quito and Riobamba.

The arc measured in the eighteenth century was only 3° long. It was decided to double this length by prolonging the measurements northwards as far as the Colombian frontier, and southwards into Peru as far as the environs of Piura. The work in Equador was carried on during 1900, 1901, 1902, 1903, and 1904, first under the direction of Captain Maurain (Commandant Bourgeois having returned to France after a stay of about six months in the field), and then of- Captain Massenet, who died at Cuenca in September, 1905.

In 1902 Captain Maurain went to Payta to study the terminal part of the chain of triangulation, built an observatory, and then determined its astronomical latitude. In 1905 Captains Peyronnel and Lallemand,

of the Artillery, arrived in Peruvian territory, and fixed the positions of the last stations of the triangulation and of the base of verification. In November, 1905, Commandant de Foulongue was appointed to take charge of the final operations. Accompanied by Captain Durand of the Artillery, he arrived in Piura at the end of December, 1905. In February, 1906, the measurement of the angles of the triangulation was completed, and the base measured on the *tablazo* about 4 kilometres south of Huaca.

After three measurements with Jäderin's system of two-coupled wires (invar metal), the whole length was measured once again with monometallic rods (also of invar), and then half of it was measured a second time with these rods. Precise levelling from the end west of La Buse to the station at Arenal, thence to Payta along the railway, connected the base with the tide-gauge at the customs jetty at the port of Payta, thence to the observatory.

Finally, Commandant Foulongue, assisted by Captain Noirel, who was at the observatory at Cuenca in Equador, determined the difference in longitude between Cuenca and Payta, which was thus connected with the longitude of Quito. This operation presented great difficulties owing to the mediocre quality of the telegraph lines, which had to be used for a distance of about 900 kilometres, both in Peru and in Equador. At the same time the astronomical azimuth of the last side of the triangulation (Payta observatory to Cerro de Chacan) was determined.

In Equador the chain of triangles runs above the inter-Andine valley, the stations being fixed on the two parallel mountain ranges. In Peruvian territory it was necessary to bend it towards the west, so as to arrive at the base by smaller and smaller triangles. But from Erco los Pozos it will be easy to pick the high Peruvian summits up very quickly, and to extend the arc along the Cordilleras right through Peru. The expedition was everywhere most sympathetically welcomed by the chief Peruvian authorities, who rendered it most valuable assistance.

COMMERCIAL MISSION TO SOUTH-EASTERN PERSIA.*

Mr. A. H. Gleadowe-Newcomen, F.R.G.S., F.S.A., president of the above mission, has, in a recent report addressed to the Government of India and the Committees of the Upper India Chamber of Commerce, Cawnpore, and the Indian Tea Cess, Calcutta, described the journey and experience of his mission through South-Eastern Persia, and recorded the present position and prospects of trade in that country. His report forms an interesting and valuable contribution to our knowledge of South-Eastern Persia.

* 'Report on the British Indian Commercial Mission to South-Eastern Persia during 1904–1905.' By A. H. Gleadowe-Newcomen, F.R.G.S., F.S.A., President. Published by the Government of India Printing Press. Calcutta: 1906.

The inception of this mission was due to the omission of Yezd and South-Eastern Persia from the scope of the inquiry into the state of British trade in Persia entrusted in 1903 to Mr. Maclean, the special commissioner appointed by the Commercial Intelligence Committee. On this omission being brought to the notice of Lord Curzon by H.B. Majesty's consul in Kerman, Major P. M. Sykes, D.S.O., the Government of India took up the matter, and invited all the chambers of commerce to assist and co-operate in sending a mission of a purely commercial character to that country. The only effective response made to this invitation was from the Upper India Chamber of Commerce and the Indian Tea Cess. Committee; with their assistance a mission, consisting of Mr. A. H. Gleadowe-Newcomen as president and Messrs. B. E. Luffman and P. F. Ryan as members, was appointed to proceed to Persia with the following objects:—

(1) To investigate the present state of trade in South-Eastern Persia.

(2) To examine the various causes which have tended, or now tend, to promote a natural and reasonable expansion of trade, especially with India, or the reasons of any shrinkage of the same.

(3) To consider measures to bring about an expansion of Indo-Persian trade.

(4) To introduce to Persians (traders, officials, and others) Indian manufactures, and explain the interest taken by the Government of India in fostering Indo-European trade and improving mutually beneficial relations.

(5) To collect statistics.

The mission left Bombay on October 13, 1904, and, after a short visit to Muskat, landed in Persia at Bundar Abbas on October 21. Here they were subjected to considerable annoyance by the Belgian director of customs, who, although he had received orders to treat the mission with every consideration and admit its baggage duty-free, attempted for several days to enforce upon them regulations and restrictions of an unnecessary and annoying character, even going so far as to disarm the Persian guard which had been placed at their service as escort.

This incident, the only occasion on which the mission met with anything but politeness and assistance from officials in Persia, has drawn from Mr. Gleadowe-Newcomen the following remarks:—

"I mention these details partly to show that there is more than a little truth in the complaint constantly heard from Indian subjects and from Persian traders alike that the (Belgian) customs authorities often cause them quite needless trouble, and that they are specially addicted to placing unauthorized restrictions in the way of British and Indian trade. If we, who had been granted special facilities from Teheran, suffered as we did from the vagaries of the customs official at the port, it is obvious that others not similarly situated must suffer more."

The mission, after some unnecessary delay due to the above causes, left Bundar Abbas on November 7 and marched to Saiadabad in Sirjan, thence to Bahramabad in Rafsinjan, and Kerman. From Kerman a tour was made through Bam and the Narmashir district to Ramrud, and back to Kerman by the Jiruft valley. Starting again from Kerman the mission marched *viâ* Yezd and Shiraz to Bushire, whence they returned by steamer to Bombay.

It will thus be seen that the mission made a comprehensive tour of South-Eastern Persia, and their long land-journey of 1790 miles included a visit to all the leading trade centres of that portion of Persia.

Mr. Gleadowe-Newcomen has much pleasure in recording that throughout this long journey, "in the course of which we met practically every individual of importance, British prestige and influence showed itself on the whole not only to be predominant, but a real power for good in the land—a fact which argues well for the future of Indo-Persian commercial relations."

The report gives an admirably complete account of the present conditions of trade in South-Eastern Persia, the difficulties and restrictions under which it is now carried on, and the possibilities of its future development and expansion. It furnishes in the form of carefully prepared appendices a large mass of statistics, which afford much interesting and valuable information.

Space does not admit of a detailed reference to the present conditions, capabilities, and requirements of the many trading centres described in this report, such as Bundar Abbas, Saiadabad, Bahramabad, Kerman, Khabis, Gok, Bam, Jiruft, Rodbar, Yezd, Shiraz, and Bushire; but the interest of the subject demands a brief mention of the comparative merits of the two chief ports in the Persian gulf, by which trade with those places is carried on. Of these two ports, Bushire and Bundar Abbas, the former at present practically monopolizes the sea-borne trade of Southern Persia. Why this should be so is very curious. It possesses every disadvantage that a port can possibly suffer from, and no attempt has yet been made to improve it. As Mr. Gleadowe-Newcomen truly says, "Bushire as a port is as inconvenient as ever it was. Cut off from the interior by a wall of mountains, it is separated from, rather than connected with, Shiraz by what is perhaps the worst road in the world. The only hospitality that the premier port of the Persian Empire has to offer ocean-going craft is that of an open roadstead, separated from the town by 3 miles of flats and shoals, and an outer roadstead, 7 miles from shore, where ships of any considerable draught or which have been delayed by accidents of wind and tide have to anchor. The place is liable to be visited by sudden snowstorms, which make the working of cargo hazardous and often impossible, and sometimes oblige ships to put out to sea to avoid being driven ashore."

By dredging a passage through the bar it would not, it is said, be "a difficult or unduly expensive feat to make Bushire into a fair harbour." At present "the unfortunate skipper has to risk two transhipments—one between the ship and the Bushire Customs Wharf, and the other between Bushire and Shief. At Shief, goods coming downwards lie on the beach exposed to the weather, awaiting, often for weeks, the pleasure of highly independent and inefficient boatmen, who, when they do take the cargo, cause infinite damage, and not seldom broach or jettison cargo confided to their charge."

As if this state of affairs were not sufficiently bad to discourage trade with Bushire, the Belgian Customs Department, by a hundred petty but harassing and inconvenient regulations, totally unsuited to local conditions and requirements, have done all they can to make trade *viâ* Bushire still more difficult and unprofitable.

On the other hand, "Bundar Abbas is the best and most conveniently situated port on the gulf, with the exception of Ahwaz, over which it has the advantage of a shorter sea-beach. It is the natural southern outlet of and entrance for the trade, not only of South-Eastern Persia, but of the whole of the immense tract of country lying between Herat and Yezd, Mishid, and Bampur. . . . There is a fairly good roadstead, which could be made into a really good harbour by dredging and the building of a mole, so as to allow of ships riding at anchor well inshore, secure from the surf set up by the south-east wind, and a pier where goods could be landed with expedition and safety."

At present the insecurity of the roads leading into the interior, owing to defective provincial administration, prevents the natural advantages of Bundar Abbas being as much made use of as they might be.

A few extracts from the able *resumé* which concludes the report under review will suffice to show the present position and requirements of British trade in South-Eastern Persia. That trade is not in as healthy a condition as could be desired. It

has been stagnant for five years, and now shows a slight decrease. Unless special efforts are made it will continue to make no progress.

"According to the statistics issued by the Belgian-Persian Customs Administration, the entire foreign trade of Persia for the year March, 1903, to March, 1904, amounted to £10,661,695—*i.e.* imports, £6,415,609; exports, £4,246,086. Of this, the lion's share is Russian, amounting to a total value of £5,668,340, of which £3,077,636 represent imports and £2,590,740 exports. The British Empire's share is £2,490,009, of which £2,138,112 represent imports and only £351,897 exports." . . .

The position, however, of the trade of the British Empire with Persia is, Mr. Gleadowe-Newcomen informs us, not so bad as it appears at first sight. In the first place, some of the falling-off "is more apparent than real, for a large proportion of the Indian tea-trade, that used to find its way into Khorassan and through Persia into Russian territory, now goes *viâ* Batum. This decreases the volume of British trade with Persia and, at the same time, increases that of Russia.

Russian trade with Persia is facilitated by the comparatively easy means of communication with Persia on the north; by the fact that the boundaries of the two countries reach along the whole extent of the northern frontier of Persia; that the population on both sides is nearly industrial in so far as wants and habits are concerned; that the richest parts of Persia are on the north; and that Russian trade is carefully nursed and bolstered up by artificial aids. No wonder, then, that Russian trade advances so rapidly.

On the other hand, British trade with Persia is heavily handicapped. The major portion enters Persia through the Gulf ports under great difficulties in landing and inland transit. Southern Persia is poor and undeveloped, and communications are insecure. British trade is not assisted by the British Government in any way, financial or otherwise, and British consuls do not always take that interest in developing commerce that Russian consuls invariably do.

Mr. Gleadowe-Newcomen finally concludes his report by enumerating the various measures necessary for developing British trade. These measures need not be quoted here in detail. They are deserving of careful consideration. They are aimed at removing or minimizing the difficulties and disadvantages by which our trade is at present handicapped. These fall under four main heads—

1. A customs tariff hostile to ourselves in its conception and provisions, and worked under a reglement which is "impractical and unjust in its terms, being utterly unsuited to the commercial, physical, and geographical conditions of the country." The tariff cannot be altered for years to come, but the reglement is subject to and imperatively needs revision.

2. The physical difficulties of the country. These can be removed by improved communications inland and by harbour construction at the Gulf ports.

3. The want of a stronger line of British policy at Teheran, and absence of proper appreciation of commercial interests and needs at our consulates.

4. The want of proper combination and initial effort among British and Indian firms trading with Persia.

Mr. Gleadowe-Newcomen has not hesitated to state the conclusions arrived at by himself and his mission with candour and boldness. His arguments appear to fully justify those conclusions, and the remedies he proposes seem reasonable and practicable.

The report is one of great interest and importance, deserving of careful perusal and consideration by all interested in the position of British trade and influence in Southern Persia.

REVIEWS.

ASIA.

India.

'India.' By Pierre Loti. Translated by G. A. F. Inman. London: T. Werner Laurie. (Undated [1906].) *Price* 10*s.* 6*d. net.*

The poetic fancy which is common to French descriptive writing and tempers scientific geographical work in that language, is as fully developed as would be expected in this book by M. Loti. But, in truth, his 'India' is difficult to consider as a geographical work. Certainly, he paints in broad colours those parts of India through which he travelled, but generally as no more than a background to his own strongly individual impressions. It is not to be supposed, however, that these impressions are without interest; they are full of it, and where the topographical background is necessary, there it is vividly portrayed. In this way, though the geographical result is fragmentary, not a few clear pictures stand out. Such are those of the environment of the "buried city" Anuradhapura, in Ceylon ("the damp green island," as the author terms it); of the journey thence to Trivandrum, where M. Loti was to present a French decoration to the Maharajah of Travancore; of the passage by the lagoons to Trichur; of Pondicherry, Hyderabad, Gwalior, and, among others, of Benares, where, as elsewhere, the author was specially attracted by the temples, religious ceremonies, and beliefs. Throughout, the author deals strictly with native life in India "without the British." The translation is generally excellent, though it must needs be occasionally felt to labour somewhat heavily in the wake of the original.

Siam.

'Lotus Land: an Account of the Country and the People of Southern Siam.' By P. A. Thompson. London: T. Werner Laurie. 1906. *With a Map. Price* 16*s. net.*

This book will form a useful work of easy reference on certain aspects of the country with which it deals. The author is concerned mainly "to give a faithful account of the peasantry, amongst whom I lived for three years." In a long and excellent introduction, with copious reference to Aymonier and other authorities—a valuable feature—he prepares the reader by touching briefly on the physical character of the land in connection with human settlement, and also goes into the diverse origin of the various peoples who dwell or have dwelt there. After a description of Bangkok, the bulk of the work is taken up with an account of the present inhabitants of the country. Their religion, traditions, folklore, customs, art, etc., are detailed. Good and apposite illustrations, from photographs or drawings, accompany each section, the most striking being, perhaps, those of architectural details in some of the splendid ancient temples. There is a large map of a most elementary character, which could have been a quarter its actual size and still serve its simple purpose.

AFRICA.

Portuguese East Africa.

'Portuguese East Africa. The History, Scenery, and Great Game of Manica and Sofala.' By R. C. F. Maugham. *With Map and Illustrations.* London: John Murray. 1906. *Price* 15*s. net.*

Mr. Maugham is British consul for Mozambique, and writes with the authority derived from several years' acquaintance with South-East Africa. His subject is not so wide as the main title of the book indicates; his narrative—the historical chapters apart—is practically confined to the territory of Manica and Sofala, *i.e.* the region

between the Zambezi and Sabi rivers. Of this region he gives, not geographical details, but vivid pen-pictures of coast and river, mountain and plain. An instructive chapter on flora and fauna is succeeded by several chapters on big-game shooting. These should not be passed over lightly by the non-sportsman; they are not mere hunting yarns, but contain much valuable zoological information. Two chapters are given to ethnology, and one, full of useful hints, to climate and health. The part of the book most open to criticism is that devoted to history. So far as the story of the Portuguese in East Africa is concerned, it need only be said that the narrative might be clearer and fuller. Mr. Maugham is, apparently, unacquainted with Theal's 'Records of South-East Africa,' the one great collection of original documents dealing with the country. It is in his references to pre-Portuguese days that the author is least trustworthy. He makes no reference to Dr. Randall-MacIver's excavations in Rhodesia. On the contrary, having stated that the ruins of the Zimbabwe near Victoria are considered by distinguished authorities to mark the spot upon which "the city of Ophir" was built, he adds, "The question in vain presents itself, at what period of the world's history were these imposing edifices erected?" A little later the author writes of the Portuguese (*c.* 1600) making a serious mistake in "abandoning" the Cape of Good Hope; which is, at the least, a misleading statement. In a brief sketch of the existing method of government in the region in which he is consul, Mr. Maugham states that there is no language-test for the executive officials. "In the great Portuguese East African province . . . few are the administrative officials possessing even a rudimentary acquaintance with the languages of the large number of natives whose interests they are believed to study, and whose disputes they are appointed to settle." This fact accounts for a great deal that is unsatisfactory in the condition of the province. Though Mr. Maugham applauds the "proper and practical" view of the Portuguese in regarding the negro as a manual labourer and nothing more, and is strong in denunciation of the mission native, he yet recognizes, with some confusion of mind, that the day of intellectual awakening of the native is coming. The book has some excellent photographs, and is a welcome addition to the literature of a little-known region.

F. R. C.

AMERICA.

Colombia.

'The Republic of Colombia.' By F. Loraine Petre. London: Stanford. 1906. *With a Map.*

Mr. Petre hopes that it may be found "useful to have, in a convenient form hitherto not available in English, some general information" regarding Colombia. It must needs be so, for this is a country whose character, capacities, and institutions are but little known, whereas this type of general descriptive work, which is not too common in English, is of no small value, even on familiar ground, when as well carried out as in the present case. The book is no doubt written primarily for those who have or seek financial interests in Colombia; but it will serve as a first lesson to the student of the country in almost any aspect. Mr. Petre deals successively with physical features; with the curious journey by steamer on the Magdalena, rail, and most primitive road from Cartagena to Bogota; with the capital itself; with the people, their history and government, the natural resources of their country, and their prospects. Mr. Petre's own travels in Colombia have not broken fresh ground, so it is not as an explorer that he appears in this work, though he gives some indication of the work of others. The book is successfully illustrated with photographs, and has a map on a scale of about 1 : 5,000,000, fairly satisfactory, but not perfectly in agreement with the text in some matters of detail.

Economics of South America.

'Panama to Patagonia.' By Charles M. Pepper. London: Hodder & Stoughton, 1906. Size 9 × 6, pp. xx + 398. *Map and Illustrations.* *Price* 10*s.* 6*d. net.*

The commercial relations of South America will undergo certain changes by the construction and opening of the Panama canal. In 1905 the author visited the Western Republics, and his book describes the country traversed; but his chief object is to describe the present, and speculate on the future, economic and industrial development of the republics of Ecuador, Peru, Bolivia, and Chile. The point of view is that of the United States, which country, by its control of the canal, will benefit materially by the shortening of its sea route to the west coast of South America.

The author claims that not only will most of the trade of the west coast, which at present goes by way of the Magellan straits, go through the canal, but that, by the series of railways across the Andes now under construction or in contemplation, some of the rubber of the Amazon, wheat of Argentina, and minerals of Bolivia, which at present flow to the Atlantic, will be captured for the Pacific and Panama route, but—we shall see. The trade of the headwaters of the Amazon may be interfered with, but it is questionable whether much will travel upstream. As regards the Argentina wheat—why should it cross the Andes? for what market?

There are full statistics. Products, shipping tonnages, populations, distances between ports, and the saving of mileage and time between the United States ports and those of South America due to the canal, all are given. Discomforts and incidents of travel, the manners and customs of the people, are noted. Climates are discussed and temperatures given. There is a chapter on the nitrate deposits of Peru, and another on Chilean social questions in which an amusing tale of the ballot-box is related. In the chapter discussing the Munro doctrine and its application to South America, comparisons are drawn between the "blundering, even stupid" English policy of investments and that of the "timid, over-cautious" Germans, and the author thinks that probably the English have been paid greater dividends "in proportion to the capital."

The book is well illustrated, there being fifty photographs depicting harbours, towns, industries, and native life. There are four very indifferent maps: on one it is allowed that the "boundaries between countries are indicated only approximately," reference notes are omitted from that of the Panama canal, while there is no scale on the other two.

W. B.

GENERAL.

The Founder of Physical Geography.

'Klassiker der Naturwissenschaften herausgegeben von Lothar Brieger-Wasservogel.' IV. Band. Varenius. Von Prof. Dr. S. Günther. Leipzig. [1906]. Verlag von Theod. Thomas.

Probably less is known of Varenius than of any of the early geographers whose books have been landmarks in the history of science, and Prof. Günther has performed a grateful service in piecing together the scattered references to a life which was in truth itself but the fragment of a life, breaking off at the moment when the masterly 'Geographia Generalis' gave promise of a brilliant future. This memoir devotes six chapters to facts about Varenius, the bibliography of his great book and the opinions of later generations upon it, and then seven chapters to the book itself, summarizing the argument and throwing much light upon the state of contemporary geographical knowledge. The text occupies 125 pages; the notes which follow, 644

in number, fill 87 pages more, and these of smaller type, constituting, we cannot but suppose, a bibliography as nearly exhaustive as diligence and learning can produce.

Bernhard Varen (whose name is universally known in the Latin form Varenius) was a German, born at Herford in Westphalia in 1621 or 1622. He studied at Hamburg under Jungius, an enlightened and progressive teacher, and passed thence to the University of Königsberg, where the studies were bounded by the writings of Aristotle, and mathematics taught in its applications to three subjects of modern interest—geography, astrology, and fortification. He studied mathematics from inclination and medicine as a duty; moved to Holland, where he lived for some time by private teaching, and, in 1649, graduated as a doctor of medicine at Leyden. But mathematics and its applications held his heart, and instead of medical practice he took to literary work for the famous firm of Elzevir, for whom he compiled a little book on Japan in 1649 for a series of geographical studies; and, in 1650, for the same firm, he produced his 'Geographia Generalis,' a single small volume in Latin. From this point nothing further is known of Varenius; he vanishes, and is presumed to have died in that year; but the book lived. After three editions of the Latin text had appeared in Holland, Sir Isaac Newton produced a revised edition at Cambridge, with the addition of diagrams, in 1672. Nearly a hundred years later the Latin text was translated into English, Dutch, and French, and it is not too much to say that the book remained the best text-book of geography for a century and a half.

In a series of chapters dealing in turn with the introductory, mathematical cartographical, nautical, meteorological, oceanographical, and geomorphological sections of the 'Geographia Generalis,' Prof. Günther shows how in each Varenius had grasped the correct guiding principles and laid down in his terse Latin sentences the main lines of the future development of the science, and justified Prof. Hermann Wagner's dictum that "Varenius is the founder of physical geography."

H. R. M.

Water Carriage.

'Our Waterways.' By Urquhart A. Forbes and W. H. R. Ashford. London: Murray. 1906.

'British Canals. Is their Resuscitation Practicable?' By Edwin A. Pratt. London: Murray. 1906.

'Ocean and Inland Water Transportation.' By Emory R. Johnson. London: Appleton. 1906.

Of the three books noted above, all dealing at least in part with a subject which is now engaging a good deal of public attention, that of inland waterways, the first two are more or less controversial, the one favouring, the other contesting the practicability of reinvigorating the inland water traffic of this country. The sub-title of the book by Forbes and Ashford describes it as 'A History of Inland Navigation considered as a Branch of Water Conservancy,' and as a history it contains much of great interest, including much of special geographical interest, more particularly in the chapters treating of the conservancy of rivers in England and Wales, both before and subsequent to the canal era; and the value of the work, both from a geographical and historical point of view, is enhanced by the appendixes giving various figures relating to the rivers and lakes of the British Isles, an alphabetical list of the canals and river navigations of the United Kingdom, distinguishing the length under railway control and that of the independent waterways, another alphabetical list of the navigations that have become derelict or got converted into railways, a chronological list of statutes, charters, grants and letters patent referred to in the work from 1225, a note on commissioners of sewers, and a list, in chronological order (from 1655), of authorities cited.

But though the sub-title of the book describes it as a history, the last chapter in it is expressly devoted to the discussion of the question of the resuscitation of our waterways, and there are many incidental observations in other parts of the book bearing on the same questions. The bias of the authors is in favour of resuscitation, and is so strong that, with every attempt to be fair, they are sometimes betrayed into the use of expressions difficult to reconcile with their candid statements of fact elsewhere. In their history of the extensive purchases of canals by railway companies (pp. 224-6), they admit that in many cases this was done by the railways under pressure in the manner more fully set forth by Mr. Pratt ('British Canals,' p. 36 onwards). They point quite justly (p. 223) to the large amount of traffic still carried by English waterways in spite of "the vastly superior facilities provided by railways;" yet they regret (pp. 228–9) that railway companies were not compelled to purchase the canals at "fair prices" (evidently something different from the prices which the canal companies were able to get and willing to take) or else prohibited from purchasing the canals, so that the traffic of the country might pass into "the more convenient and commercial channel," by which apparently is meant that of the waterways. But if railways provide "vastly superior facilities," where is the greater convenience and superior commercial character of the other mode of transport? Mr. Pratt (pp. 110-11) tells us that Mr. Carnegie, who in his 'Triumphant Democracy' has sufficiently emphasized the importance of inland waterways in the development of the United States, declared to the Pittsburg Chamber of Commerce in 1898 "that if we had a canal to-day from Lake Erie . . . to Beaver [the point on the Ohio River nearest to the lake] free of toll, we could not afford to put boats on it," and Mr. Carnegie is generally understood to be pretty well able to form a correct judgment on the commercial value of different modes of transport. Again, the admission of the fact of the large amount of traffic still carried by our waterways does not prevent Messrs. Forbes and Ashford from speaking of the English railway companies as having acquired "a virtual monopoly of the internal transport of the country" (p. 229).

The passages already quoted are taken from a chapter that is professedly merely historical. When the authors go on to discuss expressly the question of the practicability for reviving our inland waterways, it cannot be encouraging to those who hold the same view to find that their arguments are mainly based on very general considerations. "An additional proof," we are told (p. 264), "of the value of inland water-transport is to be found in the results that have attended its development in the United States and on the Continent;" and on the same page we are told that 27 per cent. of the [internal] traffic of the United States is water-borne. Now, that is true. From p. 370 of Prof. Johnson's 'Ocean and Inland Water Transportation' (a work which, it may be noted, though bearing on its title-page only the name of a London publisher, is really an American book by the Professor of Transportation and Commerce in the University of Pennsylvania) we learn that the proportion of lake-borne traffic in the United States in 1904 was about 30 per cent. of that carried by rail; but when it is considered that this lake traffic, carried on under conditions corresponding to those of the coasting traffic of our own country, has to be taken into account in order to make good the statement of the authors of 'Our Waterways,' and that, as Prof. Johnson tells us, "the traffic on the Mississippi river and on some of its tributaries, with the exception of the Ohio, is either stationary or declining" (p. 371), one is apt to conclude that in appealing to the experience of the United States as a "proof," the authors are hard pressed for an argument.

The mode of stating the case adopted by Mr. Pratt is altogether different from that followed by the authors of 'Our Waterways.' He comes into close grips with

the subject, sets forth the nature and geographical distribution of commodities which are suited for water-traffic, compares the geographical conditions favouring the use of natural waterways and the construction of adequate artificial waterways in other countries with those at home, is concrete and definite instead of vague and general, so that even those who take a more favourable view than he does of the possibilities of English waterways, are likely to find his 'British Canals' a more illuminating book than 'Our Waterways.'

As the title indicates, Prof. Johnson's work is of wider scope than either of the two others. It covers, to a large extent, the same ground as Dr. Russell Smith's 'Organization of Ocean Commerce,' reviewed in the *Geographical Journal*, vol. 26, p. 552, and to this work, as well as its author (a colleague of Prof. Johnson's), there are many acknowledgments of indebtedness in this book. So far as the two works correspond, that of Prof. Johnson differs from Dr. Russell Smith's monograph in containing numerous illustrations, nearly all very instructive, and more references to other authorities, and the inclusion of some subjects not dealt with by Dr. Russell Smith or the fuller treatment of subjects only cursorily noticed by him. Among these subjects are the Passenger Service, the Ocean Mail Service, the International Express Service, the Co-operation and Combination of Ocean and Rail Carriers, to each of which a chapter is devoted, and Government Aid to National Shipping, which is considered in more than one chapter. Every subject taken up is treated with admirable lucidity and judgment.

A remark may be made on one view shared by Prof. Johnson and Dr. Russell Smith, the influence of the causes that aid the development of line traffic in narrowing the sphere of the sailing vessel. Neither of them, indeed, ventures to predict the extinction of the commercial sailer, and when we consider the number of sailers that are still getting built, and that it is not merely steamers that are being built of larger and larger dimensions, that would be a hazardous prediction; but they both point out that one of the functions of the sailer is to carry on the irregular work of international trade, and that irregular work is in many cases likely to grow into regular and continuous work, which is most economically discharged by lines of steamers. No doubt that is true; but it must be borne in mind that very much of this irregularity is due to seasonal fluctuations over which man has no control. Consider, for example, the enormous variations from year to year in the quantity of such bulky produce as wheat and grain that has to be transported from different parts of the world. In the ten years 1891 to 1900 the total quantity of wheat and flour imported into this country varied from about 4 to 5 million tons, a variation of about 25 per cent. of the smaller and 20 per cent. of the larger figure; but of the total upwards of 1,200,000 tons came from the Black sea ports in each of the years 1895 and 1896, but less than 200,000 tons in each of the years 1898–1900. From the river Plate upwards of 500,000 tons were derived in 1894, 1895, 1899, and 1900, but in 1897 little more than 50,000 tons; from the Atlantic ports of North America in 1895 little more than 1,500,000 tons, but in 1892, 1898, and 1899 more than 2,500,000 tons. Such fluctuations make it clear that a great deal of traffic must still be left for the tramp, including the tramp sailer. It may indeed be contended that in the future, as population condenses in new countries, such fluctuations may be restricted through the growing requirements of the populations of the grain-producing countries. That may be so, but if so, it is more than the sailing-vessel that will be affected thereby. The world will then have entered on a new phase of its economic history.

G. G. C.

THE MONTHLY RECORD.

EUROPE.

Rainfall of Two English Counties.—The lately issued Geological Survey Memoirs on the Water Supply of Suffolk and the East Riding contain notes on the rainfall, by Dr. H. R. Mill, based on thirty-five years' observations brought together by the British Rainfall Organization. The period over which the observations extend is long enough, Dr. Mill points out, to justify the belief that the averages obtained (after making certain necessary corrections) will correspond, within about 2 per cent., with those of a very much longer period. A map is given in each case showing the distribution of the rainfall over the county, though in the case of Suffolk the variation from point to point is but slight. Thus the means in the case of the whole areas with a fall below or above 25 inches differ only by 1 inch (24·3 and 25·3 inches). It may be noted, however, that the high ground of the East Anglian ridge, formed by the chalk on the west and the strip of country just within the coast-line on the east, has a slightly heavier rainfall than the river-valleys or the central portion of the plain. In the East Riding the variations are much greater, the fall rising from less than 25 inches in the flat grounds to the south-east to over 32·5 inches in the high land to the north-west. Dr. Mill also discusses the seasonal incidence of the rainfall, an important consideration from the fact that it is only the fall during the six winter months that has any appreciable effect in replenishing the underground supply. In the case of Suffolk, the wettest months are October and November, and the driest April and February; though heavy falls are occasioned by thunderstorms in the summer months. These, in the East Riding, bring up the average for August to the second place on the list, October still showing the maximum. Here the half-year, October–March, during which percolation is at a maximum, has scarcely more rain than the April–September half, in which it is at a minimum.

Limnological Station in Austria.—Thanks to the impulse given to biological science in the last decades, three large zoological stations have been founded at Naples, in Heligoland, and at Trieste for the study of sea-fauna. Among the stations devoted to the investigation of the animals of fresh-water lakes is one at Plön, in Holstein, now for some years under the care of Dr. Otto Zacharias. In Austria, too, a similar limnological station has recently been erected as a permanent laboratory; and the management of it has been committed to Prof. Dr. R. Woltereck, of Leipzig. There were before, indeed, similar establishments in Austria, namely, in Bohemia, for the study of its waters. These, however, were no permanent institutions. The new limnological station is situated at Schloss Seehof 2034 feet above sea-level), near Lunz, in the south-western part of Lower Austria. Lakes, ponds, watercourses, as also a fish-breeding aquarium in the district, are placed at the free disposal of the station. The three lakes belong to the *massif* of the "Dürnstein" (6158 feet), a neighbour of the much-climbed "Oetscher" (6208 feet). They belong to the headwaters of the Ybbs, a tributary on the right bank of the Danube. The region is noted and much visited for the unique beauty of its mountain framework and its rich narcissus flora in spring. The conformation of the environment indicates distinctly the glacial origin of the lakes, as demonstrated by Richard Michael in the eighties, while their situation on three terraces of the valley and in the shadow of high rock walls, gives an opportunity for the study of the influence of differences of altitude, of mountain shadows, and of other climatic-orographical factors. The upper lake lies at the bottom of a cirque at an altitude of 3862 feet. Its investigation will, therefore, yield interesting comparisons,

e.g., with the "Grosser" and "Kleiner Teich" in the Riesengebirge, made known by the researches of Zacharias. They lie at about the same altitude above the sea as the upper lake, but three degrees farther north, sunk between rock walls. Thence the Hirschbachtal descends towards the north in several steps. From one of them plunges Ludwigsfall, 197 feet high. On another lies the small Mittersee, at a height of 2517 feet. On the terrace before the narrow outlet of the valley lies the outer Zunzer See, 2024 feet above sea-level. It is 1 mile long by about one-third of a mile average breadth, and was found by Michael to be 112 feet deep. Hydrographically one, the three lakes yet present biologically the greatest and most essential differences. The upper lake contains genera and species completely wanting in the other lakes, and *vice versâ*, while within the same genus, characteristically different subspecies in the different lakes are found. These peculiarities, together with the great wealth in them of living organisms, render the lakes in a high degree adapted for biological research. The institute has five large working-rooms, furnished with all necessary instruments and utensils, a good departmental library, photographic apparatus, large aquariums, and ample grounds for making experiments on a large scale in the open. Hydrographical and biological work has already been begun. The staff includes, besides the director, the zoologist Dr. Franz Küpelwieser, junior, and as permanent assistant, Dr. F. Ruttner, of Prague. The institute is to be open for biological research to scientific men, native and foreign. Inquiries are to be addressed to the Director of the Biological Station, Lunz, Lower Austria.

ASIA.

Return of Dr. Zugmayer.—This Austrian traveller, whose expedition to Tibet was alluded to in the January number (p. 87), has now returned to Europe, having landed at Trieste on December 18, and at once proceeded to Vienna. He had reached Leh early in October, having been forced, by severe losses among his baggage animals, to considerably curtail his original plans, which had embraced a possible visit to Lhasa. Writing from Leh to Mr. Macartney, the British agent in Chinese Turkestan, he gave some details of his experiences. After first setting out from Polu, towards Lake Markham, and passing somewhat beyond the limits of surveyed country, he had been forced to return to the upper Keriya darya, and leave there a good deal of his baggage. He then made his way *viâ* Yeshil kul to Arport Tso, but, failing to obtain the required number of yaks, found himself compelled to take a south-westerly route instead of one to the south-east. A subsequent attempt to go east was frustrated by the opposition of the Rudok officials, who threatened to stop the traveller by armed force, and he therefore made his way to Leh by a route north of the Pangong lake. He expressed himself well pleased with the zoological results of his journey.

M. Pelliot in Central Asia.—A communication from M. Pelliot (*Journal*, vol. 27, p. 87, and *ante*, p. 87), printed in the December number of the *Bulletin du Comité de l'Asie Française*, reports on the work done by the expedition down to October last, and, though not giving news of any striking discoveries, supplies an interesting appreciation of the existing state of affairs in Central Asia. While Russian Turkestan showed many traces of ferment induced by recent political events in the Far East, the indolence and apathy of the people of Chinese Turkestan —a result of the comparative ease with which their necessities are supplied by the aid of irrigation—renders them indifferent to external movements. M. Pelliot lays stress on the fact (which he himself did not at first sufficiently realize) that the basis of the population is Iranian rather than Turkish. He discusses the economic relations of the country, and shows that, although Russian trade has greatly fallen

off since the war, the geographical obstacles to easy communication with India must eventually give the commercial victory to Russia, though a readjustment of the routes of access must come about in the future with the opening of the projected railway to Semirechensk, which will give a decided preponderance to the Narym route. The work of the expedition had so far consisted in the collection of data for the chronology of the country in the Buddhist era and in the early days of Islam, and in the correction of minor details in the geography of the country traversed.

Archæological Discoveries near Turfan.—We alluded some time back (vol. **27**, p. 303) to the archæological expedition to Central Asia undertaken by Dr. von Lecoq. This traveller has for the past two years been carrying out excavations near Turfan, and some account of the results, which are of considerable interest, has been communicated to the *Times* of India by its special correspondent, who met Dr. von Lecoq at Srinagar on his return from his expedition. The traveller, who is of Huguenot descent, had made previous archæological discoveries in the vicinity of Aleppo, where he unearthed the ruins of an Aramaic city. For some months the investigations at Turfan were without fruit. But then Dr. von Lecoq's assistant, Bartus, stumbled on what is called a "noble treasure trove," consisting of wall pictures or frescoes and a host of manuscripts in ten different languages, viz. Nagari, Central Asian Brahmi, Tibetan, Chinese, Tangut, Syriac, an unknown tongue (a curious and undeciphered variation of Syriac), Manichæan, Uighur, and primitive Turkish. The latter has an alphabet much like the Runes, which are the letters of the old Norse language. Most of the manuscripts are on paper, some on soft and carefully dressed white leather, and some on wood. There were numerous evidences of Iranian inhabitants and influences in these parts, and also gruesome evidence of the persecution of Buddhism by the Chinese many hundreds of years ago in the shape of the packed bodies "clad and odorous" of a multitude of Buddhist monks who had been immured alive in the dungeon of a temple. The wall paintings on plaster are Buddhistic, and are supposed to indicate the missing stepping-stone by which Indian art advanced across Asia to Japan. Dr. von Lecoq has now returned to Germany, leaving his researches and excavations to be carried on by his former chief, Prof. Grunwedel. The amount of manuscript records and antiquarian remains sent home by Dr. von Lecoq must be enormous, thirty cases having been brought by him personally over the Himalayan mountains, and two hundred cases having been sent home *viâ* Russia. It is pronounced to be the biggest material haul made in antiquities for half a century.

Dr. Tafel's Journey to North-East Tibet.—A letter, written by Dr. Tafel from the Barun district of Tsaidam on August 1, 1906, is printed in the twelfth number of *Petermanns Mitteilungen* for that year. It gives a brief account of the writer's explorations in the region of the upper Hwang-ho since the dates of his previous communications (*Journal*, vol. **28**, pp. 398, 506). On April 23 he had started from Shara-ḱuto, the last frontier post of the Chinese, a little to the south-east of the Kuku Nor, the snow then still lying nearly a foot in depth. An icy wind also blew, and a considerable number of his yaks soon succumbed to the hardships of the march. Keeping generally east of the route followed by previous explorers (including that of Lieut. Filchner and himself in 1904), Dr. Tafel encountered greater physical difficulties, it being necessary to cross all the valleys and streams running east or south-east to the main river, and his progress was at last stopped by the Churnon-chu, a deep and rushing stream, beyond which rose a mass of mountain chains with the north-west to south-east direction characteristic of the Kwen-lun system. A renewed attempt to reach the Amne-mashin by the route of Kozlof and Roborovsky proved fruitless, and Dr. Tafel seems to have

turned north-west for Tsaidam, though not before he had obtained fresh proof of the extraordinarily sharp bend made in this region by the Hwang-ho. He has made extensive zoological collections, as well as a geological examination of the route, and has obtained much material for the improvement of the maps of the region.

French Expedition to Western China.—A mission to Western China and the adjacent Tibetan borderlands has been entrusted to Captain D'Ollone by the Paris Geographical Society and the Comité de l'Asie Française, which latter body, in the December number of its *Bulletin*, announces the departure of the expedition on December 23. Captain D'Ollone, who is accompanied by Lieuts. de Fleurelle and Lepage (the former charged with the topographical and geological work), will proceed *viâ* Tongking to Yunnan, and thence northwards through Sechuan and Kansu, keeping as near as possible to the eastern frontier of Tibet, and studying the aboriginal populations of the region to be traversed—Lolos, Miao-tse, Sifans, etc. He proposes to return through Shensi and Shansi to Peking, and expects to be away about two years. In spite of recent work on the Eastern Tibetan frontier, notably that of Lieut. Filchner and Dr. Tafel, there remains a considerable field for investigation, and interesting results may be anticipated.

AFRICA.

The Abyssinian Agreement.—The agreement negotiated last summer between representatives of Great Britain, France, and Italy in respect of the relations of the three Powers with Abyssinia was finally signed in London on December 13, 1906, the text being printed as 'Treaty Series, No. 1, 1907.' The general purport of the agreement is to pledge the three contracting parties to uphold, as far as possible, the integrity of Abyssinia, and to secure equality of treatment as regards trade, etc., to the subjects of all three. They also agree to take concerted action to secure the maintenance of what are regarded as the special interests of each of the three parties, *e.g.* in the case of Great Britain and Egypt, the regulation of the waters of the Nile and its tributaries. It is agreed that the Jibuti railway shall be prolonged, by the present or any other French company which may be substituted for it with the consent of the French Government, from Dire Dawa to Adis Abeba, with a branch line to Harrar eventually, but the French Government will endeavour to secure the appointment of a British and an Italian representative on the board of the French company. All railway construction in Abyssinia west of Adis Abeba, so far as foreign assistance is required, shall be under the auspices of Great Britain, while the latter reserves the right, conceded by Menelik on August 28, 1904, to construct a railway from British Somaliland to the Sudanese frontier, after previously coming to an agreement with the other two powers. Any railway construction with a view to joining Eritrea with the Benadir coast, west of Adis Abeba, shall, so far as foreign assistance is required, be carried out under the auspices of Italy.

South African Survey Work.—The latest report of the astronomer at the Cape, for the year 1906, records the occupation of stations up to 13° 58′ S. by the parties engaged in the measurement of the arc of the 30th meridian under Dr. Rubin. It had been hoped to organize a central office for the completion of the topographic survey of British South Africa south of the Zambezi, but want of funds had delayed the realization of the project. The field-work of the geodetic survey in the Transvaal and Orange River Colony had been completed, and the results of the survey of Southern Rhodesia had been passed through the press. Telegraphic determinations of the longitude of Accra on the Gold Coast and of St. Helena had been successfully carried out—in the former case, by Major Watherston, R.E., and Mr. Pett; in the latter, by Messrs. Pett and Cox. The results were to place Accra (the exact spot not stated) 49·552 ± 0·086 seconds west of Greenwich,

and St. Helena (the Briars, about 2·7 seconds west of Johnson's observatory on Ladder hill) 22 minutes 50·554 ± 0·087 seconds west of Greenwich; the corresponding values in arc being approximately 12′ 23·3″ and 5° 42′ 38″·3 west of Greenwich. Facilities were given at the observatory for the exchange of signals with Swakopmund, but the results had not been received.

Journey over the Masai Steppe.—Dr. Jaeger, whose account of Mount Meru is referred to in the January number, p. 88, has lately made a trip across the arid steppe to the west of the Pangani river, the physical characteristics of which have hitherto been imperfectly understood. A short account of the journey is given in the *Zeitschrift* of the Berlin Geographical Society (1906, pp. 579–581). The objective was the supposed small lake or series of lakes known as Kiniarok, to reach which it was necessary to make a wide *détour* to the south; as the bridges over the Pangani were all destroyed by the flood-water. As no guides were to be obtained at Mgera, north of the Nguru range, it was necessary to go still further west to the Kiyungu hills, before striking north. Even so, the traveller has eventually to trust to his own guidance across the arid and uninhabited steppe, but was fortunate in finding the widely separated watering-places. Kiniarok was found to be merely a grassy steppe, with no water on the surface even shortly after the close of the rains. The portion of the Masai steppe which had been traversed, formed a very even surface of degradation, from which rose isolated summits ("Inselberge"). This surface is almost certainly older than the fault-scarp by which the steppe falls to the Pangani lowland, and has in course of time been eroded into a gently undulating complex of hill and valley, the elevations consisting of laterite, the depressions of black peaty soil, both sometimes overlain with steppe limestone. Instead of forming, as might have been supposed, an inland basin, the country far to the west of the Pangani belongs morphologically to the basin of that river. Running water is, however, absent, apart from the temporary streams which descend the fault-scarp to the Pangani. Water-holes are of two kinds—those occupying hollows in the rock-surface, which rarely dry up, and those occupying shallow depressions in the valley alluvium, which do not long outlast the rainy season. At this period large portions of the valley-troughs are no doubt under water. The vegetation consists of low thorny scrub, thicker toward the south, on the ridges and slopes, and grass, with some bush, on the valley flats. The country was formerly occupied to some extent by Masai, but now the only signs of habitation are widely separated Wanderobo kraals.

French Survey of the West Coast of Morocco.—Considerable progress has been made during the past year in the execution of the hydrographical survey of the west coast of Morocco, which was commenced in 1905 by a French mission under the command of Naval Lieut. A. H. Dyé (see *Journal*, vol. **27**, p. 199). The French Morocco Committee, under whose auspices the mission is at work, publishes in its November bulletin (*B. Com. Afr. Franç.*, 1906, No. 11, p. 307) Lieut. Dyé's third summary report, in which special attention is directed to the discovery of various submerged rocks in the neighbourhood of Mazagan, and to an important error in the location on existing maps of the stretch of coast from Casablanca to Mogador. The longitudinal reckonings on which the charts have hitherto been based appear to have been at fault to the extent of from 6 to 7 kilometres, the coast-line requiring to be moved that distance west of the position it at present occupies on the maps. The geodetic surveys which were carried out in 1905, from Laraiche into the Sebu valley, and from Mazagan to Saffi, have during the past year been supplemented by surveys between Mogador and Saffi, and between Rabat and Casablanca. The mission is still in progress, and by the end of the present year (1907) it is hoped to publish a new general map of the whole stretch of coast

from Tangier to Agadir. Numerous soundings have also been taken during the past year in the coastal waters from Saffi to Rabat, and these, in conjunction with the hydrographical observations which were secured in the previous year, have enabled many improvements to be introduced into the charts of this part of the African coast. Eight sheets of maps based on the soundings taken in 1905 have been completed, and three sheets showing the results of last year's hydrographical studies are in course of preparation, while numerous special reports on a variety of subjects—economic, sociological, commercial, political, medical—are also included in the results of the mission.

Tristan Da Cunha.—A Blue Book, embodying correspondence relating to Tristan Da Cunha, includes an interesting and comprehensive account of the island and islanders. At a distance of 1500 miles from the Cape and 2000 from Montevideo, the island, from a circular base of 31 to 34 square miles, rises, a symmetrical volcanic cone, extinct during historic times, to a height of 7640 feet. Owing probably to wave-erosion, the outline of the base presents a barrier of nearly vertical cliffs, 1000 to 2000 feet from beach to crest. The first climb to the summit, above the cliffs, was made, 1817, by Captain Carmichael. In an account of his visit, read before the Linnean Society, he estimates the principal crater at nearly a mile in circumference, the southern edge 250 feet lower than the northern, with a shallow lake at its bottom, 150 yards in diameter. Other craters are scattered over the declivity of the dome. The cliffs are thickly clothed with tussock grass 8 to 10 feet high, under shelter of which lie the moss-and-mud nests of the "molly hawk" and "sooty albatross." Clumps of a scrubby tree, interspersed with the grass, provide firewood. On the rich pasture (dying off in winter) of a plateau 100 feet above the sea, thriving cows yield very good milk. Much moisture is discharged from the cloud encircling the summit. Unfortunately, no meteorological record has been kept. Lieut. Rich's statistics (August–November, 1816) give the mean temperature at 55° Fahr., maximum 82°, minimum 40°. Captain Cloete reports (1816 and 1817) "Constant rains." Of peculiar interest is the account of the islanders. Numbering seventy-seven on January 23, 1904, distributed among seventeen families, they come of a very mixed ancestry, including Dutch, Italian, African, and Asiatic. Rather above the average type of European peasantry, they show no sign of physical or mental deterioration, though, from want of intercourse, slow of speech and action. There is no government proper, no laws, no crime or immorality, no envy or malice, but they readily render one another voluntary assistance. They therefore refuse the offer of transportation to the Cape, however attractive the conditions. Resources still unexploited within reach of the islanders, are the working of guano deposits on Nightingale and Inaccessible islands, whaling, and fish-curing. The establishment of Tristan as a port of call, and that of a weather-forecast station, seems advisable.

AMERICA.

Recent Survey of Niagara.—The summary report of the Geological Survey of Canada for 1905, issued towards the close of last year, contains some interesting notes by Prof. J. W. Spencer on his recent examination of Niagara, which has supplied new and valuable data for calculating the rate of recession of the fall, as well as for an estimate of the results to be expected from the power-utilization schemes lately set on foot. Prof. Spencer's former contributions to our knowledge of the history of the falls are well known. His recent survey, the first undertaken on the Canadian side, was commenced in October, 1904, and was devoted exclusively to the Canadian falls, the recession of the American falls being immaterial on account of its slowness. It results from his work that during the years 1890 to 1905 the recession has been only about half of that of the previous fifteen years. Only a

small part of this reduction can be traced to the use of the water on the American side, much being due to the greater resistance lately offered by the shape of the crest, for it has been found that the rate of recession is far from uniform. Another cause is the lessened discharge occasioned by the changing level of Lake Erie. Prof. Spencer finds that the recession is not caused solely by the undermining of the hard overhanging limestones, but that these are breached along joints, and finally wedged off, allowing the water to strike upon lower ledges. A special feature at the edge of the fall is the alternation of a broad or flat crescent with one having a wedge-shaped apex. The amount of recession has averaged 2·2 feet per annum as compared with 5·4 feet between 1875 and 1890. Since 1842 the centre of the falls has receded 285 feet, all effected before 1886, the subsequent processes having merely widened the crescent. Nine-tenths of the total discharge of Niagara comes down through the Canadian channel, and the level of the river above is determined by a ledge of rock which extends near the head of Goat island almost to the Canadian shore. As the largest power company takes its water at the end of this ridge, it is certain that a large volume of water will be drawn off from the New York side, the whole discharge from the Canadian falls being also affected. The contemplated reduction of 10 to 15 per cent. will narrow the channel, and divert the water from its shallower portions. Prof. Spencer points out that the international boundary is not, as has often been supposed, a changeable feature, but was established by the commissioners in 1819. It runs about 300 feet from Goat island (thus placing all but one horn of the crescent of the Canadian falls within Canadian territory), and is not far from the deep part of the channel. Prof. Spencer has carried out, under considerable difficulties, soundings of the river at various points in the gorge, using Tanner-Blish sounding-tubes, which effect their purpose by recording the weight of the superincumbent water. Many remarkable features have been brought out: thus close under the Goat island shelf a depth of 192 feet was found. The full results are, however, withheld until the significance of the whole can be presented. Prof. Spencer has seen reason to increase his former estimate of the age of the falls, and of the length of time which must elapse before the diversion of the waters into the Mississippi.

The Bogoslov Islands, Bering Sea.—The three islands known by this name have all made their appearance above the sea within the space of little more than a century, the third and largest rising above the water about the time of the great Californian earthquake, on which account some have supposed a connection to have existed between the two disturbances. Some notes on this and the earlier islands, with illustrations, are given in the December number of the *Popular Science Monthly* by President Jordan and Mr. G. A. Clark of Stanford University. These writers are, on the whole, inclined to doubt the possibility of the supposed connection with the San Francisco earthquake, the rise of the third Bogoslov having been attended with little if any disturbance in the immediate vicinity, while the distance and the depth of the intervening sea seem to render the idea improbable. The first island appeared in 1796, and an account of its advent, by a Russian trader, Kriukof, is to be found in Kotzebue's narrative of discovery in 1817. The second island was first seen in September, 1883, by Captain Anderson of the schooner *Matthew Turner*. The islands have been subject to rapid disintegration, and the "Ship rock," which formerly rose above the sea in their midst, has entirely disappeared. The naming of this rock is universally ascribed to Cook during his last voyage, but Prof. G. Davidson calls our attention to the fact that the name occurs neither in the narrative of this voyage nor on the charts published therewith, while inquiry at the Admiralty has elicited the fact that the rock is not named in Cook's original charts. Prof. Davidson points out that the island appears as "Ship

Rock" in A. Arrowsmith's chart of the Pacific of 1798, and says that this cartographer no doubt obtained the name from the journals of officers. A small view of Bogoslov island, with the rock in its vicinity, was given in Lütke's 'Voyage autour du Monde,' 1836.

Earthquake in Jamaica.—Another destructive earthquake, comparable in its effects with those which devastated San Francisco and Valparaiso during 1906, took place in Jamaica on January 14, the city of Kingston bearing the brunt of the shock. Great loss of life and destruction of property are reported, the city being virtually reduced to a mass of ruins, while, as in the case of last year's catastrophes, the fires which broke out did their share in the work of destruction. A serious sinking of the ground took place along a portion of the coast, greatly increasing the depths of water in the harbour, and rendering useless those of the wharves which had escaped destruction by fire. The number of killed cannot be much less than two thousand, a considerable proportion being Europeans, among them Sir James Fergusson, who had lately arrived on a visit. The British delegates to the Agricultural Congress, which had just been opened by the Governor, all, however, escaped. The area of greatest intensity seems to have had a radius of 10 or 12 miles, beyond which little or no damage was done. It is too soon to enter into the scientific aspects of the event, though it may be noted that, as in other instances, minor earthquake shocks were reported about the same time from other parts of the world, though it would, of course, be hazardous to conclude that any connection necessarily existed between them. It is stated in *Nature* for January 17, that shocks were felt on the 10th of that month at Christiania, Frederikstad, Gottenburg, Arvika, and Upsala, while it has been reported that Trondhjem and a large part of Northern Norway experienced severe earthquake shocks on the 15th. On the 17th a slight shock was felt at Oban and adjacent parts of the west of Scotland. The Mauna Loa volcano in Hawaii has also been reported in active eruption.

American Expedition into the Interior of South America.—A scientific expedition, headed by Dr. W. C. Farabee, instructor in anthropology at Harvard University, has started for South America for the purpose of research, mainly anthropological, in the imperfectly known region on the borders of Peru, Bolivia, and Brazil. Dr. Farabee, who has the support of the Peabody Museum at Boston, and is accompanied by a doctor and two assistants, will proceed *viâ* Colon to Arequipa in Peru, whence he will cross the Andes to the chosen field of work. It is proposed to devote three years in all to the intended investigations.

AUSTRALASIA AND PACIFIC ISLANDS.

The Murchison and Davenport Ranges, Central Australia.—Mr. Allan A. Davidson, whose report on his expeditions to the northern territory of South Australia was referred to in the *Journal* for June, 1906 (p. 633), sends us some notes on the general characters of the above ranges, visited by him, which together form the most striking geographical feature north of the MacDonald range. The general elevation varies between 500 and 1000 feet above the plains, which themselves lie at an altitude of 1000 to 1200 feet above sea-level. The geological formation consists of quartzite, sandstone, conglomerates, etc., with interbedded sheets of eruptive rocks—diorites, diabase, and others. A striking feature is the continuous series of long uniform ridges of quartzite and sandstone, separated by narrow parallel valleys. Their uniformity is only disturbed in the vicinity of the central cores of the pre-Cambrian rocks over which the quartzites have been folded. This system of valleys and ridges has been formed by the denudation of the softer sandstone between hard zones of quartzite, and the rapid decomposition of the

interbedded eruptive rocks which in many places replace the soft sandstone. The ranges are traversed by an extensive series of creeks, many of considerable size, with low banks and sandy channels up to 200 feet in width. On leaving the ranges they cut out channels through the sandy plains for long distances, but gradually die out in sandy country or spread out into pools over loam flats. Water-holes are numerous along the creeks for six months after heavy rains, but the only lasting supply occurs in a few natural tanks cut out of hard rock either by the swirl of a flooded creek at a bend, or by waterfalls. Several kinds of fish, weighing up to 12 ozs., occur in these water-holes, being probably varieties of species which occur in the rivers of the upper territory. Along the eastern flank granite occurs, with eruptive and metamorphic rocks, and both here and in the eruptive belts within the ranges gold, copper, and galena were found, but hardly in paying quantities. The natives appear to be gradually dying out. In the Tennant creek district a peculiar custom was noticed, many of the women being not allowed to speak for long periods after the death of their husbands. An extensive sign language has thus been developed. Animal-life is scarce, though after rains insect and other pests develop with startling rapidity.

Irrigation Scheme for the Murrumbidgee Valley.—We understand that Dr. J. P. Thomson, Secretary of the Queensland Branch of the R.G.S. of Australia, has lately reported to the New South Wales Government on the possibilities of irrigation in the Murrumbidgee basin, in regard to which a vast scheme has lately been set on foot with a view to guarding against the great losses of stock brought about by the droughts of recent years. The most important part of the scheme is the formation of a great reservoir by the erection of a dam across the Murrumbidgee at Barren Jack, about 30 miles from Bowning station on the Sydney to Melbourne railway. The river has here cut a deep gorge with walls over 300 feet high through a solid ridge of granite, and it is proposed to build a solid wall 200 feet high across this, impounding the waters of the river for a distance of 40 miles. It is claimed that the capacity of the reservoir will be little inferior to that on the Nile above Assuan, and that the area of irrigable lands will exceed that supplied by the Nile reservoir. The distribution of the water will be effected entirely by gravitation. Dr. Thomson has also inspected the dam now being constructed across the Cataract river to provide Sydney with an additional water-supply. The full height of this is 154 feet.

The New Hebrides Convention.—The protocol respecting the New Hebrides, signed in London by representatives of France and Great Britain on February 27, 1906, was confirmed by a formal convention dated October 20, 1906, the text of which has since been printed as a Parliamentary paper (Cd. 3160). The outcome is virtually to establish a condominium in the islands. In Art. 1 it is laid down that "The group of the New Hebrides, including the Banks and Torres islands, shall form a region of joint influence, in which the subjects and citizens of the two signatory powers shall enjoy equal rights of residence, personal protection, and trade, each of the two powers retaining jurisdiction over its subjects or citizens, and neither exercising a separate control over the group." Each of the powers is to be represented in the group by a high commissioner with a police force under his orders, and provision is made for the regulation of public services, finance, native administration, judicial functions, land questions, and so on. A joint court is established having jurisdiction both in civil and criminal cases, though under the latter head this is apparently valid only in the case of offences committed by natives against non-natives. The provisions in respect of land questions are among the most important, but others have to do with shipping matters, recruiting of labour, and the like. The seat of government is to be at Vila, in the island of Efate.

The Island of Yap, Caroline Group.—A comprehensive and copiously illustrated account of the island of Yap, based on personal study, is given in the *Zeitschrift für Kolonialpolitik* of April and June, 1906. The monograph, which extends to 144 pages, embraces all aspects of the subject. Eighty, or, including its environing reef, 166 square miles in area, Yap is an acute-angled triangle, with its base to the north-east, apex to the south-west. Base and side lines are gashed with deep sea-channels, in many places penetrating through the reef into the interior land. From the mountainous north-east, rising over 900 feet high, runs south-westwards a backbone of gently declining heights, ending in a plain of coralline sand rising but a few metres above sea-level. Belonging botanically to the Malayan archipelago, this land is more fruitful, especially in coco-palms, in the south-west than in the mountainous chain running north-east. The salt-water zone is occupied with mangrove. The strand zone is mostly barren sand. The cultivated zone, covering the depressions of the coast and part of the ascending land, consists of confused forest, field, and garden. Villages of irregularly scattered houses and huts lie between the wild tropical woods and the partly wild growths of coconuts, breadfruits, *Pangium edule*, etc. Round the detached dwellings lie little gardens of bananas, papaws, sweet oranges, water-melons, citrons, pumpkins, bananas, etc.; at further distance, in particularly favourable sites, are smaller fields of taro, yams, sweet potatoes and sugar-cane. The European eye misses the presence of flowers. Save for the frequently occurring pandanus, mountain ridges and tops are almost treeless, and attempts at afforestation have as yet met with the scantiest success. Tropical in climate, the mean temperature in the shade is between 82° and 90° Fahr. There is no sharply divided dry and rainy season; the climate is strikingly uniform. In Yap the variation of temperature throughout the year does not amount to more than 9° Fahr. Nor is the temperature by night considerably less than by day. Poor in its flora, Yap is perhaps still poorer in its fauna. Of mammals it has only the rat, mouse, and bat. Dogs and pigs have been introduced. The latter are numerously distributed over the island, but the flesh is of very poor quality. There are almost no singing birds, but Yap is exceedingly rich in its marine fauna. The greater part of the paper is devoted to the anthropology of Yap.

POLAR REGIONS.

Captain Amundsen's Voyage and its Results.—As has already been announced, Captain Amundsen has promised to give an account of the voyage of the *Gjöa*, by the North-West Passage, at the meeting of the Society on February 11. Meanwhile, we learn from a Norwegian correspondent that the observations taken during the expedition have arrived safely at the Ethnographic Museum in Christiania, where the two large iron cases, formerly oil-tanks, which contained them, have lately been opened. The contents consisted of 94 different items—57 of magnetic observations in duplicate, 13 tin boxes of magnetic curves (photographic), 20 meteorological journals in rough and transcript, and lastly 4 parcels of astronomical observations. The meteorological records consist of the journals kept during the whole voyage from Christiania to King's point, together with the barograms and thermograms taken with the self-registering apparatus at the two winter stations, Gjöahavn and King's point. A separate journal of the Aurora Borealis was also kept. The magnetic collections include observations taken at Godhavn in Greenland, at Beechy island, and at Gjöahavn, as well as in King William's Land, Boothia Felix, and at King's point. The self-recording magnetic instruments were set up, and were continuously in action at Gjöahavn from November, 1903, to May, 1905, and at King's point from October, 1905, to March, 1906. All the magnetic observations are said to be as complete and correct as if made at any

of the great European observatories. The photographic magnetic curves have been developed, and are in a good condition. All of them are good and successful. The value of these observations is out of all proportion to the cost of the Gjöa Expedition, which amounted to about £1800 only.

Dr. Thalbitzer's Expedition to East Greenland.—In the summer of 1905 Dr. W. Thalbitzer left Europe, accompanied by his wife, with a view to spending a year at the remote Danish trading station at Angmagsalik, the only permanently inhabited spot on the east coast of Greenland, which enjoys communication with the outside world only once in the year by means of a steamer which visits it during the summer, starting from the more frequented west coast. Dr. Thalbitzer has now returned to Europe after successfully accomplishing his purpose, which consisted in linguistic and ethnological research among the long isolated Eskimo of that part of Greenland. In order to make use of the yearly steamer, he was obliged to proceed first to the west coast, and reach his destination by doubling Cape Farewell and penetrating (after some delay through stormy weather) the unusually broad stream of ice carried down the east coast by the polar current. During his stay at the settlement (which derives its name from an important fjord, called by the natives Ammattalik, from a small fish, *Mallotus villosus*, which occurs in large numbers there), Dr. Thalbitzer was able to collect a large amount of new material in the form of folk-songs and tales, mystic formulæ, etc. The whole district now possesses a population of only about 450 souls, who display in many ways a higher degree of culture than the West Greenland Eskimo, and find a rich hunting-ground in the fjords of the neighbourhood. Dr. Thalbitzer also studied the language of the people, which differs from that of the West Greenlanders, and brought back phonograph records of their songs, etc.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Limits of a Coastal Zone: Alluvial Flats of the Arno.—The problem of the exact definition of the "coastal zone" (also with less exactness termed the "coast") has engaged considerable attention within recent years. While the popular idea of a coast refers merely to the portion of land immediately adjoining the sea, the attempt has been made by geographers to lay down limits, more in accordance with scientific requirements, for the belt of country differentiated from the inland region by its relation to the sea. Some writers, among whom was Ratzel, took into account anthropogeographical or biological factors, while others restricted themselves to those concerned with geology or morphology. Very various results have thus been reached, while some have denied that any useful conclusion can be attained by the inquiry. The latest contribution to the subject is an elaborate paper by Dr. R. Hunger in the *Mitteilungen* of the Leipzig 'Verein für Erdkunde' for 1905 (issued during 1906). In reviewing the work of his predecessors, Dr. Hunger agrees with Ratzel that it is impossible to arrive at any generally applicable definition, but that the limits must be laid down in individual cases according to the type of coast or the particular object in view. He considers that, broadly speaking, it is the geological and morphological factors on which stress should be laid, and that the question should be separately studied with regard to the various physical types of coast. As a special case he has chosen the Tuscan coast at the debouchment of the Arno and neighbouring streams, into the geological and topographical history of which he enters with great minuteness. He shows that, while this region has been subjected to great changes within the historic period owing to the rapid accumulation of the sediment brought down by the rivers, the changes since the opening of the Quarternary period are far greater, and account must be taken of these in defining the interior limit of the coastal flats. At that epoch the

sea penetrated far inland by a series of arms which reached, on the present course of the Arno, to the site of the village of Fucecchio. The Monte Pisane then formed an island, while east of this a long tongue of land ran down to near Pontedera, with water on each side of it. The limits assigned by Dr. Hunger follow in the main the contour of the higher ground by which the river-flats are bounded, but portions of the valleys which have been excavated within recent times are excluded. The surface features corresponding to the limits of the coastal zone are described in somewhat wearisome detail, and a doubt may be felt whether the exact definition of the coastal flats is of the importance which Dr. Hunger attaches to it. However, the paper is of interest from the light which it throws on the past changes of the coast-line and the relative rates of advance at different periods. The extension of the land since about 900 A.D. is marked by a succession of parallel lines of dunes of which the innermost reaches the greatest altitude, and probably marks a period of relative standstill, the subsequent more rapid advance being ascribed in part to the effects of human settlement (*e.g.* the deforestation of the hill-sides). The gradual increase of the distance between Pisa and the sea since the founding of the city can be deduced from historical data. An interesting section traces the history of human settlement in the area in question.

Measurement of the Height of Clouds by Reflectors.—Following the erection, on the Schwarzenbergplatz, Ringstrasse, of the "Leuchtbrunnen" (light-fountain), a new, simple, and altogether exact method has been arrived at in Vienna for determining the height of the clouds above the surface of the Earth. The illumination by electric reflectors of the high-jet fountain is effected from beneath. Does the cone of light, ascending perpendicularly, strike the cloud, it imprints on it a light-spot. Dr. J. Rheden, assistant at the Vienna astronomical observatory, hitherto known by his feats in the field of astrographics, noting the fact, bethought him to measure the angle of elevation (α) of the light-spot on the clouds, as seen from the astronomical observatory. The distance (d) of this point of observation from the source of light (the Leuchtbrunnen) being exactly known, the height (h) of the light-spot, *i.e.* of the clouds, becomes readily determinable ($h = d \tan \alpha$). The first measurements were instituted from June 14 to 24, and the results showed the clouds to be at heights of from 5000 to 33,000 feet. By these experiments it was found that sometimes under perfectly clear weather, on projecting the cone of light aloft, the light-spot appeared as an indication of the existence of a layer of moisture. As is well known, the clouds often lie in layers at very unequal heights one above another, such as the naked eye itself distinguishes. The first observation by reflectors showed the under layer to be at 5100 feet; the upper at 8400 feet. A second gave the lower layer at 9800 feet; the higher at 33,000 feet. Finally, a third observation showed three layers at heights respectively of 6200, 12,500 and 14,000 feet. The new method surpasses in exactitude the most trustworthy of the methods hitherto applied, namely the photogrammetric, determining as it does the altitude in question with positive certainty. It is hoped to start a systematic course of such observations in other parts of the Earth as well. There is no doubt that not only for science, but also for practical weather forecasts, such observations will prove highly serviceable.

GENERAL.

Research Department of the Society.—In opening the first meeting of this department for the present session, Major Close gave a brief account of the work of the Research Committee during the previous year. There had, he said, been two special objects of research—the one being the investigation of rainfall and run-off, as well as the matters in suspension and solution in English rivers; the

other an investigation into the changes that have taken place on the East Coast, especially in the neighbourhood of the Humber estuary. Good advance had been made with the first investigation, while something had been done in regard to the second, a very complete list of books and maps having been compiled by Mr. Shepherd, and lately published. The next step, based on those books and maps, would be to investigate the whole matter in order to see the changes that have actually taken place, and this would go on during the ensuing year. During the course of the past year a considerable number of papers had been read in the Research Department, their subjects being—"The Next Great Arctic Discovery," by Sir Clements Markham; "The Ordnance Survey Maps from the Point of View of the Antiquities on Them," by Mr. Haverfield; "Inquiry into the Resources of the British Empire," by Prof. Scott Elliot; "The Ruins of Rhodesia," by Dr. Randall MacIver; "Distribution of Alpine Races in Europe," by Mr. J. L. Myres; "Physico-Geographical Problems in Seistan," by Sir H. McMahon; and "A Plea for an Expedition to Melanesia," by Dr. A. C. Haddon.

Oceanographical Laboratory at Edinburgh.—A laboratory for oceanographical research, organized through the efforts of Mr. W. S. Bruce, leader of the Scottish Antarctic Expedition, was formally opened by the Prince of Monaco during a visit to the city in January. The laboratory is installed in a portion of the Surgeons' Hall in Edinburgh.

CORRESPONDENCE.

The Survey of India.

Simla, September 12, 1906.

I BEG to acknowledge the receipt of a copy of the Royal Geographical Society's *Journal* for August, 1906. I have been a Fellow of the Society for many years, and receive my private as well as official copies as a matter of ordinary routine, and I therefore presume that the special copy to which I refer was sent me in order to call my attention to the review of the report of the Survey of India for 1903–04 by T. H. H.

I have no intention of embarking on any paper controversy, but I wish to point out that the review in question conveys a very inadequate idea of the great task that lies before the Survey of India at the present time.

The writer, while remarking that the report is chiefly interesting when read by the light of subsequent recommendations made by the special Survey Committee, proceeds to state that that committee concerned itself mainly with the question of *maintaining* an accurate and up-to-date topographical map of India and of the Indian border, and he goes on to say that it is therefore interesting to observe, from the map illustrating the progress of Imperial Surveys, that there is really very little of the Indian peninsula left to map topographically, etc., etc.

I think he must have overlooked that the committee recommend that a complete topographical map, *on the* 1-*inch scale*, shall be prepared and published in colours for the whole of India, and, further, that the scale of survey shall be usually at least double the scale of publication. It further lays down that the size of the maps shall be reduced by one-half, that they shall be based on the latest geodetic value of the longitude of Madras, and, though it lays down no definite rules, it laid great stress on the necessity of additional heights and contours, two important details to which all but the latest surveys have paid little attention. The map illustrating the progress of Imperial Surveys does not show the areas that have

been surveyed on scales suitable for the production of modern 1-inch maps, but merely shows the areas surveyed from the date of the commencement of survey work in India by organized parties of some form or other on a variety of scales, and the maps of vast areas are entirely out of date owing to their antiquity. As a matter of fact, there are at the present time no maps of India on the 1-inch scale which, either in form or quality, meet the requirements of the committee, and the whole series will have to be re-drawn. Those more nearly conforming to modern requirements cover a large portion of Burma and small areas in the Punjab, the Central Provinces, and the United Provinces, and next to these come the maps of the Bombay Presidency, of Mysore, and of portions of the Punjab, but none of these are based on the latest value of the longitude of Madras.

A glance at the "General Map to illustrate the Distribution of the Various Classes of Survey Work required for the Preparation of a Topographical Map of India on the scale 1 inch = 1 mile," published opposite p. 115 of vol. 1 of the Survey Committee's report, will give a rough idea of the work to be done. Of the areas coloured red no surveys on the 1-inch scale have ever been made, and consequently these areas must be actually surveyed on either the 1-inch or the 2-inch scale. Of the areas coloured, blue maps in some shape or other on the 1-inch scale exist, and this colour is used to denote areas where the topography will have to be re-done, but the trigonometrically fixed points *may* be found sufficient to obviate the necessity of re-triangulation.

The area under these two headings above amounts to approximately 1,159,300 square miles (*vide* p. 43, vol. 1, of the committee's report). Taking the area of India and its dependencies at approximately 1,830,600 square miles, and the area to be actually surveyed, or "re-surveyed" as opposed to "revised," at 1,159,300, it will be seen that in the twenty-five years allowed for the completion of the work no less than 73,224 square miles will have to be fair mapped, and 46,372 square miles will have to be actually surveyed or "re-surveyed" on the 1-inch or the 2-inch scale yearly, a task that no nation has yet had to attempt, and one which will require the utmost energy and determination to accomplish. Perhaps, if all goes well, some twenty-five years hence T. H. H.'s estimate of the work now before the department may be applicable to the then immediate future, but at present it falls far short of the absolute facts.

F. S. Longe, Col. R.E.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1906–1907.

Christmas Lecture, Friday, January 4, 1907.—"Japan and the Japanese as I saw them." By Miss A. L. Murcutt.

Christmas Lecture, Monday, January 7, 1907.—"A Lady's Journey from the Cape to Cairo." By Miss Mary Hall.

The Right Hon. Sir G. T. Goldie, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

Fifth (Special) Meeting, January 12, 1907. The Right Hon. Sir George T. Goldie, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

The paper read was :—

"An Expedition to Mount Ruwenzori." By His Royal Highness the Duke of the Abruzzi.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendes.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Italy—Sicily. *C.R.A. Sc.* **142** (1906) : 1001–1003. **Lugeon and Argand.**

Sur la grande nappe de recouvrement de la Sicilie. Note de MM. Maurice Lugeon et Emile Argand.

Italy—Vesuvius. *National G. Mag.* **17** (1906) : 318–325. **Jaggar.**

The Eruption of Mount Vesuvius, April 7–8, 1906. By T. A. Jaggar, junr. *With Illustrations.*

Italy—Vesuvius. *C. Rd.* **142** (1906) : 941–944. **Lacroix.**

Sur l'éruption du Vésuve et en particulier sur les phénomènes explosifs. Note de A. Lacroix.

Italy—Vesuvius. *C. Rd.* **142** (1906) : 1020–1022. **Lacroix.**

Les conglomérats des explosions vulcaniennes du Vésuve, leurs minéraux, leur comparaison avec les conglomérats trachytiques du Mont-Dore. Note de A. Lacroix.

Italy—Vesuvius. *C. Rd.* **142** (1906) : 1244–1249. **Lacroix.**

Les avalanches sèches et les torrents boueux de l'éruption récente du Vésuve. Note de A. Lacroix.

Jura. **Legaret.**

B.S.G. Lyon **19** (1904) : 253–271 ; **20** (1905) : 42–54, 115–128, 215–231, 301–313 ; **21** (1906) : 31–49.

Répartition et Mode de Groupement des populations dans le Jura Central et Méridional. Par G. Legaret.

Lake of Constance. *Globus* **89** (1906) : 284–285. **Halbfass.**

Seenkunde und Völkerrecht. Von Prof. Dr. W. Halbfass.

Discusses a question of jurisdiction that has lately arisen.

Norway. *B. American G.S.* **38** (1906) : 337–348. **Brigham.**

The Fiords of Norway. By A. P. Brigham.

Norway—Anthropology. *Skrifter Vidensk. S. Christiania*, 1905 (No. 5) : pp. 29. **Daae**

Indlands- og Kystbefolkningens Legemshøide, Favnevidde, Brystomfang og Siddehøide. Ved A. Daae og H. Daae. *With Maps.*

Compares the measurements ascertained for inland and coast dwellers.

Norway—Climate. *Z. Gletscherkunde* **1** (1906): 46–61. **Øyen.**
Klima- und Gletscherschwankungen in Norwegen. Von A. P. Øyen. *With Illustrations.*

Norway—Historical. *Forhandl. Vidensk.-S. Christiania* (1905): No. 5, pp. 29. **Olsen.**
Det gamle norske ønavn Njarðarlog. Af Magnus Olsen.
This name is used for the first time in Olav Tryggvessøn's saga, for the island at the entrance to Hardangar fjord, now called Tysnesø.

Norway—Magnetism. **Geelmuyden.**
Skrifter Vidensk-S. Christiania, 1905 (No. 3): pp. 23.
Den magnetiske Misvisning i Norge. Af H. Geelmuyden.

Pyrenees. *B.S.G. Com. Bordeaux* **29** (1906): 185–196, 205–210. **Descombes.**
La propriété communale dans les Pyrénées et l'aménagement des montagnes par l'initiative privée. Par P. Descombes.

Rhone. **Uetrecht.**
Die Ablation der Rhone in ihrem Walliser Einzugsgebiete im Jahre 1904–05. Inaugural-Dissertation . . . vorgelegt von E. Uetrecht. Bern, 1906. Size 10 × 7, pp. 66. *Illustrations. Presented by the Author.*

Rumania—Petroleum. *B.S.G. Română* **27** (1906): 129–156. **Mircea.**
Distribuțiunea geografică a petroleului în țara noastră, de C. R. Mircea.

Russia. *Deutsch. Erde* **4** (1905): 205–207. **Hasse.**
Die Deutschen in Russland. Von Ernst Hasse. *With Map.*

South-West Europe—Place-names. *Deutsch. Erde* **4** (1905): 41–47. **Jungser.**
Deutsch-spanische Ortsnamen. Von Johannes Jungser. *With Maps.*

Sweden. ———
Svenska Turistföreningens Årsskrift, 1906. Stockholm: Wahlström & Widstrand, 1906. Size 8½ × 5½, pp. viii. and 402. *Maps and Illustrations. Presented.*

Sweden and Norway. **Mohn.**
Une page d'Histoire de la Civilisation! La Suède et la Révolution Norwégienne. Par Alfred Mohn. Paris and Geneva, [1906]. Size 7½ × 5, pp. 150. *Price 1 fr. 50. Presented by Dr. A. G. Nathorst.*

Sweden—Lapmark. *G. Ts.* **18** (1905–06): 227–228. **Porsild.**
Den naturvidenskabelige Station ved Vassijaure i Torne Lapmark. Af Morten P. Porsild. *With Sketch-map and Illustration.*

Sweden—Meteorology. *K. Svensk. Vet.-A. Handl.* **40**, No. 1 (1906): pp. 60. **Hamberg.**
Moyennes mensuelles et annuelles de la température et extrêmes de température mensuels pendant les 150 années 1756–1905 à l'Observatoire de Stockholm. Par H. E. Hamberg. *With Diagrams.*

Switzerland. ———
Statistique de la Suisse, 148e Livraison. Mouvement de la Population de la Suisse pendant l'Année 1904. Berne: A. Francke, 1906. Size 11 × 9, pp. 32.

Switzerland—Fauna. **Bretscher.**
Zur Geschichte des Wolfes in der Schweiz. Von Dr. K. Bretscher. (Neujahrsblatt der Naturforschenden Gesellschaft in Zürich auf das Jahr 1906; 108 Stück.) Zürich, [1906]. Size 11 × 9, pp. 40. *Illustrations.*

Switzerland—Hydrology. **Schardt.**
B.S. Belge Géologie (Mém.) **19**, 1905 (1906): 559–570.
Note sur l'origine des sources vauclusiennes de la Doux (source de l'Areuse) et de la Noiraigne, canton de Neuchâtel (Suisse). Par H. Schardt. *With Profiles.*

Switzerland—Hydrology and Meteorology. ———
Table de Récapitulation des Principaux Resultats des Observations hydrométriques suisses, 1902. Bern, 1905. Size 15 × 10, pp. 60.
Tableaux graphiques des Observations hydrométriques suisses et des températures de l'air et des hauteurs pluviales, 1904. Bern, 1905. Size 15½ × 10. *Diagrams.*

Turkey—Samothrace. *Deutsch. Rundschau G.* **28** (1906): 352–357. **Schleiff.**
Eine Besteigung des Phengari auf Samothraki. Von Direktor V. Schleiff.

United Kingdom—Archæology. *P.R.S., Ser. A.* **77** (1906): 465–472. **Lockyer.**

On the Observations of Stars made in some British Stone Circles. Second Note. By Sir Norman Lockyer. *With Diagram.*

United Kingdom—Ireland—Limnology. *T.R. Irish A.* **33** (1906): *B.*, 77–116. **West**

A Comparative Study of the Plankton of some Irish Lakes. By W. West and Prof. G. S. West. *With Plates.*

United Kingdom—Scotland. *Z. Gletscherkunde* **1** (1906): 21–30. **Geikie.**

Late Quarternary Formations of Scotland. By Dr. James Geikie, F.R.S. *With Diagram.*

United Kingdom—Wales. *Geol. Mag.* **3** (1906): 262–265. **Greenly.**

The River Cefni in Anglesey. By E. Greenly. *With Sketch-map.*

United Kingdom—York. **Auden and others.**

A Handbook to York and district. Prepared for the 75th Meeting of the British Association for the Advancement of Science, 1906. Edited by Dr. G. A. Auden. York: J. Sampson, 1906. Size 7½ × 5, pp. xvi. and 366. *Plan and Illustrations.*

AFRICA.

South Africa—Geology. **Hatch.**

Presidential Address, delivered to the Geological Society of South Africa, at the Annual Meeting, on January 29, 1906. By Dr. F. H. Hatch. [From the *Proceedings* of the Geological Society of South Africa, 1906, pp. xxi.–xxxiv.] Size 10 × 7½. *Presented by the Author.*

On the South African, especially the Transvaal, geological formations.

Togo. *M. Deutsch. Schutzgeb.* **19** (1906): 113–131. **Koert.**

Das Eisenerzlager von Banjeli in Togo. Von Dr. Koert. *With Map and Plate.*

Transvaal—Ethnology. *J. Anthrop. I.* **35** (1905): 365–386. **Gottschling.**

The Bawenda: a Sketch of their History and Customs. By the Rev. E. Gottschling. *With Plate.*

Transvaal—Irrigation. *Transvaal Agricultural J.* **4** (1906): 733–742. **Hurley.**

Irrigation in the Transvaal. By F. A. Hurley.

Uganda. *Alpine J.* **23** (1906): 185–202. **Freshfield.**

Towards Ruwenzori.—II. By D. W. Freshfield. *With Illustrations. Also separate copy.*

West Africa—Boundary. ———

Treaty Series. No. 14, 1906. Convention between the United Kingdom and France respecting the Delimitation of the Frontier between the British and French Possessions to the East of the Niger. Signed at London, May 29, 1906. London: Wyman & Sons, 1906. Size 10 × 6½, pp. 10. *Maps. Price* 1*s.* 1*d.*

See note in the Monthly Record for November, 1906 (p. 509).

West Africa—Boundary. *Deutsch. Kolonialblatt* **17** (1906): 593–595. ———

Grenzfestsetzung zwischen dem deutschen Gebiete Nordwest-Kamerun und dem britischen Gebiete Nigeria von Yola an bis zum Tschad-See. *With Map.*

See *Journal* for November, 1906, p. 509.

NORTH AMERICA.

United States—North Carolina. **Cobb.**

Notes on the Geology of Currituck Banks. By Collier Cobb. (Reprinted from the *Journal of the Mitchell Society*, vol. 22, No. 1.) Size 9 × 6, pp. [4].

United States—Pennsylvania. **Falckner and Sachse.**

Falckner's Curieuse Nachricht von Pennsylvania. The book that stimulated the great German Emigration to Pennsylvania in the early years of the eighteenth Century. A Reprint of the Edition of 1702, amplified with the Text of the Original Manuscript in the Halle Archives. Together with an Introduction and English Translation of the Complete Work. By Dr. J. F. Sachse. Philadelphia, 1905. Size 10 × 7, pp. x. and 256. *Facsimile Maps and Illustrations. Price* $3 *net.*

United States—Texas. *Science* **23** (1906): 849–851. **Udden.**

The Origin of the Small Sand Mounds in the Gulf Coast Country. By Prof. J. A. Udden.

United States—Texas. *Science* **23** (1906): 818-819. **Wentworth.**
A Few Notes on "Indian Mounds" in Texas. By Irving H. Wentworth.

United States—Virginia. *National G. Mag.* **17** (1906): 358-362. ——
The Luray Caverns. *With Illustrations.*
These caverns are in the Shenandoah valley.

CENTRAL AND SOUTH AMERICA.

Peru—Irrigation. *B. Cuerpo Ingen. Minas Perú*, No. 34 (1905): pp. 42. **Hurd.**
Estudio para aumentar las aguas del Rio Chili (Arequipa). Por H. C. Hurd. *With Maps and Diagrams.*

Rio de la Plata. *B.I.G. Argentino* **22** [Part 2]: 89-121. **Martinez.**
Etnografia del Rio de la Plata. Por Benigno T. Martinez.

South America. **Créqui-Montfort.**
Int. Amerikanisten-Kongress **14** *Tag.*, 1904 (1906): 531-550.
Fouilles de la mission scientifique française à Tiahuanaco. Ses recherches archéologiques et ethnographiques en Bolivie, au Chili et dans la République Argentine. Par le Comte G. de Créqui-Montfort. *Illustrations.*

South America—Archæology. **Uhle.**
Int. Amerikanisten-Kongress **14** *Tag.*, 1904 (1906): 567-579.
Bericht über die Ergebnisse meiner südamerikanischen Reisen. Von Dr. M. Uhle. *Illustrations.*

Trinidad. *J.R. Col. I.* **37** (1906): 487-502. **Craig.**
The Oilfields of Trinidad. By E. H. Cunningham Craig.

Uruguay. ——
Años 1902 y 1903. Anuario Estadístico de la República O. del Uruguay. Tomo II. Montevideo, 1906. Size 11½ × 8, pp. xx. and 802. *Diagrams.*

West Indies—Leeward Islands. **Watts.**
Report on the Sugar Industry in Antigua and St. Kitts, Nevis, 1881 to 1905. By Francis Watts. (Colonial Reports, Miscellaneous No. 35, 1906.) Size 10 × 6, pp. 16. *Diagrams. Price* 3*d.*

AUSTRALASIA AND PACIFIC ISLANDS.

South Australia—Meteorology. **Todd.**
Meteorological Observations made at the Adelaide Observatory, and other places in South Australia and the Northern Territory, during the years 1902-1903, under the direction of Charles Todd. Adelaide, 1905. Size 13 × 8½, pp. xx., 110, and 66. *Map.*

Tahiti. *Questions Dipl.* **21** (1906): 807-818. **Bracconi.**
La colonisation française à Tahiti. Par P. Bracconi. *With Map.*

Western Australia—Botany. **Diels.**
Die Vegetation der Erde . . . herausgegeben von A. Engler und O. Drude. VII. Die Pflanzenwelt von West-Australien südlich des Wendekreises. Mit einer Einleitung über die Pflanzenwelt Gesamt-Australiens in Grundzügen. Ergebnisse einer im Auftrag der Humboldt-Stiftung der Kgl. Preussischen Akademie der Wissenschaften 1900-1902 Unternommenen Reise. Von Dr. L. Diels. Leipzig: W. Engelmann, 1906. Size 10½ × 7, pp. xii. and 414. *Map and Illustrations.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Oceanography. *J. Geology* **14** (1906): 221-225. **Lane.**
The chemical evolution of the Ocean. By A. C. Lane.

Oceanography. ——
Conseil Permanent International pour l'Exploration de la Mer. Rapports et Procès-Verbaux des Réunions. Volume 4. Juillet, 1904—Juillet, 1905. Copenhagen, 1905. Size 10½ × 8½, pp. xxxviii., 104, and 74. *Chart.*

Oceanography—Atlantic. *La G.* **13** (1906): 425-436. **Pettersson.**
L'Atlantique, mer inexplorée. Par O. Pettersson. *With Diagrams.*

Oceanography—Black Sea. *Ann. Hydrographie* **34** (1906): 162–179. **Wissemann.**
Die Oberflächenströmungen des Schwarzen Meeres. Von W. Wissemann. *With Diagrams.*

Oceanography—Catalogue. ——
Internationale Ausstellung für Meereskunde und Seefischerei in Marseille, 1906. Amtlicher Führer durch die Deutsche Abteilung. Size 9½ × 6, pp. 24. *Plate. Presented by the German Commission to the Exhibition.*

Oceanography—Currents. **Berget.**
B. Musée Oceanograph. Monaco, No. 73 (1906): pp. 20.
Cours d'Océanographie fondé à Paris par S. A. S. le Prince Albert de Monaco (2e année). Les Courants marins—Le Gulf-Stream. Par A. Berget. *With Diagrams.*

Oceanography—Currents. *Ann. Hydrographie* **34** (1906): 114–122. **Forch.**
Zur Theorie der Meeresströmungen. Von C. Forch.

Oceanography—Dead Water. **Ekman.**
On Dead Water: being a description of the so-called phenomenon often hindering the headway and navigation of ships in Norwegian Fjords and elsewhere, and an experimental investigation of its causes, etc. By V. W. Ekman. With a Preface by Prof. V. Bjerknes.—The Norwegian North Polar Expedition, 1893–1896. Scientific results. Vol. 5, xv., pp. 1–152. London: Longmans & Co., 1906. *Maps and Plates.*

Oceanography—Depths. ——
List of Oceanic Depths and Serial Temperature Observations received at the Admiralty during the year 1905, from H.M. Surveying Ships and British Submarine Telegraph Companies. London: J. D. Potter, 1906. Size 13½ × 8½, pp. 32. *Price 2s.*

Oceanography—Expedition. *Ann. Hydrographie* **34** (1906): 145–147, 220–227. ——
Die Forschungsreise S.M.S. "Planet."

Oceanography—Instrument. **Marini.**
Ludovico Marini. Il Mareografo d'alto Mare del Comandante Mensing. Metodi per la misura della pressione a profondita nel mare. Stazioni talassologiche autoregistatrici complete. (Rivisita Maritima: Estratto dal fascicolo di dicembre, 1905.) Rome, 1905. Size 9 × 6½, pp. 20. *Diagram. Presented by the Author.*
The instrument shows the changes of tide by registering the variations of pressure.

Oceanography—North Sea. **Reibisch.**
Faunistisch-biologische Untersuchungen über Amphipoden der Nordsee. II. Teil. Von Dr. J. Reibisch. (Aus dem Laboratorium für internationale Meeresforschung in Kiel. Biologische Abteilung Nr. 6.) Kiel, 1906. Size 13 × 10½, pp. 185–235. *Plates.*

Oceanography—Plankton. ——
Conseil Int. Exploration Mer, Publ. Circonstance, No. 33 (1906): pp. viii. and 122.
Catalogue des espèces de plantes et d'animaux observées dans le plankton recueilli pendant les expéditions périodiques depuis le mois d'août 1902 jusqu'au mois de mai 1905. Publié . . . avec la coopération de C. H. Ostenfeld.

Phytogeography. *Naturw. Wochenschrift* **5** (1906): 305–310. **Potonié.**
Die Fichte als Moorbaum und über unsere Moore. Von H. Potonié. *With Illustrations.*

Seismology. *Nineteenth Century* **60** (1906): 647–650. **Gardner.**
The Problem of Earthquakes. By J. S. Gardner.

Seismology. *Atti R.A. Lincei*; 5. *Rendiconti* **15** (1906): *I. Sem.*, 15–18. **Monti.**
Sulla misura della velocità di propogazione delle perturbazioni s'smiche in rapporto alla sismometria razionale. Nota di V. Monti.

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La Spéléologie au XXe siècle. (Revue et Bibliographie des Recherches Souterraines de 1901 à 1905.) *With Plans and Illustrations.*
A valuable summary of recent research, with bibliography.

Terrestrial Magnetism. *Terrestrial Magnetism* **11** (1906): 65–92. **Bauer.**
The Magnetic Survey of the North Pacific Ocean: Instruments, Methods, and Preliminary Results. By L. A. Bauer. *With Map and Illustrations.*

Terrestrial Magnetism. *Met. Z.* **23** (1906): 145–149. **Hellmann.**
Ueber die Kenntnis der magnetischen Deklination vor Christoph Columbus. Von G. Hellmann. *With Plate.*

Terrestrial Magnetism. *C. Rd.* **143** (1906): 139–140. **Mercanton.**
Sur l'inclinaison magnétique terrestre aux époques préhistoriques. Note de P. L. Mercanton.

Tides. *National G. Mag.* **17** (1906): 303–309. **Harris.**
Cotidal Lines for the World. By R. A. Harris. *With Maps.*

Volcanoes. *J. Geology* **14** (1906): 259–268. **Dutton.**
Volcanos and Radio-activity. By Major C. E. Dutton.

Zoology. *National G. Mag.* **17** (1906): 367–423. **Shiras.**
Photographing Wild Game with Flashlight and Camera. By Hon. G. Shiras. *With Illustrations.*
Striking photographic pictures from life.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Historical—Early Travels. **Purchas.**
Hakluytus Posthumus or Purchas His Pilgrimes. By Samuel Purchas, B.D. Vols. **15** and **16**. Glasgow: James MacLehose & Sons, 1906. Size 9½ × 6, pp. (vol. **15**) xiv. and 568; (vol. **16**) xx. and 580. *Illustrations. Price* 12*s.* 6*d. net per volume.*

Historical—Maps. *B. American G.S.* **38** (1906): 365–368. ———
The Leardo Map of 1452.
This map, a facsimile of which appeared in Ongania's collection, has lately been presented to the American Geographical Society.

Historical—Tavernier. *J. Asiatique* **7** (1906): 273–280. **Hamy.**
Une lettre inédite du voyageur J.-B. Tavernier (1664), publiée et commentée par le Dr. E.-T. Hamy.

Political. *John Hopkins University Studies* **24** (1906): Nos. 5, 6, pp. 196. **Hildt.**
Early Diplomatic Negotiations of the United States with Russia. By John C. Hildt.

Transport. *Deutsch. G. Blätter* **29** (1906): 154–176. **Egerer.**
Die Entwicklung der städtischen Personenverkehrsmittel. Von E. Egerer.

GENERAL.

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The English Catalogue of Books (including the original "London" and "British" Catalogues), giving in one Alphabet, under Author and Title, the Size, Price, Month, and Year of Publication, and Publisher of Books issued in the United Kingdom of Great Britain and Ireland. Vol. 7. January, 1901, to December, 1905. London: The Publishers' Circular, Ltd., 1906. Size 10 × 6. *Price* £3 13*s.* 6*d. net.*

Educational. *Nineteenth Century* **60** (1906): 632–646. **Macnaghten.**
Geography in our Public Schools. By R. E. Macnaghten.

Gazetteer. **Ritter and Penzler.**
Ritters geographisches-statistisches Lexikon über die Erdteile, Länder, Meere, Häfen, Seen, Flüsse, Inseln, Gebirge, Staaten, Städte, Flecken, Dörfer, Bäder, Kanäle, Eisenbahnen, Post- und Telegraphenämter u.s.w. . . . Neunte . . . Auflage. Unter der Redaktion von Johannes Penzler. 2 vols. Leipzig: Otto Wigand, 1905–1906. Size 10½ × 7, pp. (vol. **1**) 1248, (vol. **2**) iv. and 1360.

Livingstone College. ———
Livingstone College Year Book, [1906]. Containing Hints to Travellers in matters of Health, Outfit, and Travel. Travellers' Health Bureau, Livingstone College, Leyton, E., [*not dated*]. Size 7 × 5, pp. 112. *Illustrations. Presented by the Livingstone College.*

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EUROPE.

England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from December 1 to 31, 1906.

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Finland. **Wijkberg and Arppe.**

Karta öfver Storfurstendömet Finland utgifven af Öfverstyrelsen för landtmäteriet, jemlikt Kejserliga Senatens förordnande. Maurus Wijkberg and Wilhelm Arppe. Scale 1 : 2,400,000 or 1 inch to 37·9 stat. miles. Sheets: A4, B3, D3. Helsingfors, 1906.

France. **Service Géographique de l'Armée, Paris.**

Carte de France. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheets: XXII.-13, Pontoise; XXII.-14, Versailles; XXII.-15, Rambouillet; XXIII.-13, l'Isle-Adam; XXIII.-14, Paris; XXIII.-15, Corbeil; XXIV.-13, Dammartin-en-Goële; XXIV.-14, Lagny; XXIV.-15, Brie-Comte-Robert. Paris: Service Géographique de l'Armée, [1906]. *Price* 1.60 *fr. each sheet.*

For many years past the need of a map of France on a larger scale than 1 : 80,000 has been seriously felt, and, in consequence, a number of sheets of the well-known 'Carte de France' on that scale were enlarged to 1 : 50,000, after comparison with the original survey sheets and notes, which are not available to the public. It was, however, found that this information was not sufficiently complete for the purpose in view, and therefore the work of enlarging the 1 : 80,000 map to 1 : 50,000 was suspended in 1884. In 1900 the French Government, on the recommendation of General Berthaut, decided to commence an entirely fresh survey of the country, and upon this as a basis to publish a new map on the 1 : 50,000 scale. The nine sheets above mentioned, which include the neighbourhood of Paris, are the first instalment of this map to be issued to the public; and they certainly are most creditable productions, in general appearance and colouring resembling the sheets of the map of Algeria and Tunis published by the same department.

The map is graduated both in grade divisions and in the more familiar degrees, minutes, and seconds, and each sheet embraces 11 minutes of latitude and 22 minutes of longitude. It is projected in separate latitudinal zones, and thus the angle formed by the meridians varies.

The relief of the land is shown by contour-lines at 10-metre intervals. The levelling is referred to the older basis of Bourdaloüe, and to reduce this to the more recent zero a constant of $-0{\cdot}64^{m}$ must be applied.

The system of colouring adopted renders the map far more easily legible than the old 1 : 80,000 survey sheets, which are in black only. In the present map buildings and streets in towns are shown in red; water, blue; lettering and general communications and boundaries, black; parks and wooded lands, green; and contour-lines, brown.

When complete the map will consist of about 1100 sheets, and it is to be hoped that funds will be forthcoming to enable the Service Géographique de l'Armée to finish this important undertaking without unnecessary delay.

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: X.-27, Lesparre; XIX.-32, Velleraugue; XXV.-26, Albertville. Paris: Ministère de l'Intérieur, Service Vicinal, 1906. *Price* 0.80 *fr. each sheet.*

These are new editions.

Germany. **K. Preussische Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartographischen Abteilungen der Königlichen Preussische Landesaufnahme. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: (coloured) 269, Berlin; 294, Schöneberg. Berlin: K. Preussische Landesaufnahme, 1906. *Price* 1.50*m. each sheet.*

Ireland. **Bartholomew.**

Map showing the Surface Geology of Ireland. Reduced chiefly from the Ordnance and Geological Surveys under the direction of Sir Archibald Geikie, D.SC., LL.D., F.R.S., late Director-General of the Geological Survey. Topography by John Bartholomew, F.R.G.S. Scale 1 : 633,600 or 1 inch to 10 stat. miles. Edinburgh: John Bartholomew & Co., [1906]. *Price* 6*s. net. Presented by the Publisher.*

The amount of detailed geological information that is shown on this map is, considering its scale, surprising, and although there are nearly thirty different colour tints and symbols used, there is no confusion. However, the work is so minute, owing to the great reduction, that it requires careful inspection before it can be read intelligibly. As a specimen of colour tint printing it is excellent.

Turkish Empire. **Huber.**

Empire Ottoman. Division Administrative. Dressé d'après le Salnamé de 1899/1317 par Commandant R. Huber. Scale 1 : 1,500,000 or 1 inch to 23·7 stat. miles. 4 sheets. [Constantinople, 1906.]

ASIA.

Arabia Petræa. **Musil.**

Karte von Arabia Petraea nach eigenen Aufnahmen von Prof. Dr. Alois Musil. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. 4 sheets. Vienna: Alfred Hölder, [1906]. *Price* 15*m. Presented by the Publisher.*

So little survey work of any kind has been carried out in the region south and east of the Dead sea that Prof. Musil's map will meet with a ready welcome by all those interested in the region. This four-sheet map, based upon the author's route-surveys

and sketches, combined with other material, extends from the north end of the Dead sea to the Gulf of Akaba, and from the Mediterranean to 37° east of Greenwich. It certainly is the best map of the region yet published, notwithstanding the fact that many of the districts shown away from the routes depend upon nothing but the roughest sketches. The south-western part of the map is specially interesting at the present time, inasmuch as it includes the region of the Turko-Egyptian boundary between the Gulf of Akaba and the Mediterranean. Here, however, the map differs considerably, as regards the land features, from the results of the recent boundary survey, a reduction of which was published in the January number of the *Geographical Journal*.

Ceylon. **Surveyor-General, Ceylon.**

Colombo in 1904–5. Scale 1:3,168 or 20 inches to 1 stat. mile. 28 sheets. Mr. P. D. Warren, F.R.G.S., Surveyor-General, Ceylon. Colombo: Surveyor-General's Office, 1906. *Presented by the Government of Ceylon.*

China. **Topographical Section, General Staff.**

Province of Ho-Nan. Compiled in the Topographical Section, General Staff. Scale 1:1,000,000 or 1 inch to 15·8 stat. miles. London: Topographical Section, General Staff, War Office, 1906. *Price 2s. 6d. Presented by the Director of Military Operations.*

India. **Bartholomew.**

Thacker's Reduced Survey Map of India. By J. G. Bartholomew, F.R.G.S. Scale 1:4,435,200 or 1 inch to 70 stat. miles. Third Edition. Calcutta: Thacker, Spink, & Co.; London: W. Thacker & Co. 1907. *Presented by Messrs. John Bartholomew & Co.*

This is a new edition. As regards India itself, the work of revision appears to have been very carefully done; but in the adjoining regions of Tibet, the recent surveys of the British Expedition do not seem to have been taken full advantage of. However, it is a most useful general map, the value of which is increased by the excellent index to place-names, and the insets, plans, and maps dealing with special subjects.

Kashmir. **"Petermanns Mitteilungen."**

Karte des westlichen Kaschmir. Nach englischen Quellen. Scale 1:1,000,000 or 1 inch to 15·8 stat. miles. *Petermanns Mitteilungen*, Erganzungsheft No. 155. Gotha: Justus Perthes, 1906. *Presented by the Publisher.*

AFRICA.

Africa. **Langhans.**

Justus Perthes' Wandkarte von Afrika zur Darstellung der Bodenbedeckung. Bearbeitet von Paul Langhans. Scale 1:7,500,000 or 1 inch to 118·4 stat. miles. 4 sheets. Gotha: Justus Perthes, [1906]. *Presented by the Publisher.*

The basis of this map is the six-sheet map of Africa in the last edition of Stieler's Hand-Atlas. Upon this are superimposed six different and carefully selected tints, showing in a general manner the character of the vegetation and surface features of the land, the first of these, a dark green, indicating dense tropical forest, whilst the last, a light grey, shows sand and stone deserts and salt steppes. Political boundaries are also laid down, and at the bottom of the map there appears a set of small exploration inset-maps of Africa, showing the routes of the principal travellers at different dates from 1768 to 1900. Four other inset-maps, including one of the Cape Colony on an enlarged scale, are given on the south-west sheet, and along the top of the map runs a line of portraits, bearing more or less resemblance to fourteen of the principal African explorers. The railways on the map require a little revision, and the Mombasa-Uganda line is not shown by the symbol by which the other working railways are indicated, and gives the impression that it is only under construction. The map is accompanied by a most complete and useful index to place-names.

Although called a wall-map, the names and details are much too minute to be read at a distance. The surface-feature colouring is fairly bold, but even this can only be read by standing fairly close to the map.

Egypt. **Bartholomew.**

Bartholomew's Tourist's Map of Egypt and the Lower Nile. Prepared from the latest surveys. Scale 1:1,000,000 or 1 inch to 15·8 stat. miles. Edinburgh: John Bartholomew & Co., [1906]. *Price 3s. net. Presented by the Publisher.*

This is a new edition of a map published in 1897. The principal map shows the Nile valley from the delta to Wadi Halfa. There are inset-plans of Alexandria and

Cairo, and another, on a small scale, of the whole of Lower Egypt and the Sinai peninsula.

German East Africa. **Spieth and Moisel.**

Karte des südlichen Teiles der Nguru-Berge. Auf Grundlage der neuen Aufnahmen von Bezirksamtmann Spieth 1904–1905 und mit Benutzung der veröffentlichen Karten konstruiert und gezeichnet von H. Nobiling unter Leitung von M. Moisel. Scale 1 : 150,000 or 1 inch to 2·4 stat. miles. *Mitteilungen aus den deutschen Schutzgebieten*, Band 19, 1906. Berlin: E. S. Mittler & Sohn, 1906. *Presented by Herr Max Moisel.*

Morocco. **Service Géographique de l'Armée, Paris.**

Carte du Maroc. Scale 1 : 500,000 or 1 inch to 7·9 stat. miles. Sheets: 2, Tangier; 4, Fez. Paris: Service Géographique de l'Armée, [1906]. *Price* 1 *fr. each sheet.*

Two sheets of a new map of Morocco on a larger scale than any map hitherto published. Together they include the region between 32° 20′ N. lat. and the Mediterranean, whilst in longitude they extend from the Atlantic to Melilla. As no systematic survey has been made, with the exception of the coast-line, the sheets have been solely compiled from route-sketches of varying merit, and in many districts it is evident that the information can only have been very approximate.

Orange River Colony. **Surveyor-General, O.R.C.**

Map of the Orange River Colony and Basutoland, with surrounding portions of the Cape Colony, Transvaal, and Natal. Scale 1 : 740,000 or 1 inch to 11·7 stat. miles. Compiled from the best available information in the Surveyor-General's Office, Bloemfontein, O.R.C., 1906.

A general and somewhat highly coloured map of the Orange River Colony. In addition to the map itself, useful tables are given, as insets, of the population and area of different districts. Although decidedly sketchy in appearance, such information as is found on the map has been taken from the latest material, the population tables being based upon the census of 1904.

Togo. **Sprigade.**

Karte von Togo. Bearbeitet von P. Sprigade. Scale 1 : 200,000 or 1 inch to 3·1 stat. miles. Sheets: D-1, Kête-Kratschi; D-2, Atakpâme. *Mitteilungen aus den deutschen Schutzgebieten*, Band 19, 1906. Berlin: E. S. Mittler & Sohn, 1906. *Presented by Herr Max Moisel.*

AMERICA.

Alaska. **U.S. General Land Office.**

Alaska. Compiled from the official Records of the General Land Office, U.S. Coast and Geodetic Survey, Geological Survey, Canadian and other sources, under the direction of Frank Bond, Chief of Drafting Division, G.L.O., 1906. Scale 1 : 3,801,600 or 1 inch to 60 stat. miles. Washington: Department of the Interior, General Land Office, 1906.

Canada. **Department of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets: 20, Souris, revised to October 8, 1906; 70, Moose Mountain, revised to October 13, 1906; 117, Red Deer Forks, revised to November 19, 1906; 119, Regina, revised to November 3, 1906; 120, Qu'Appelle, revised to October 26, 1906; 121, Riding Mountain, revised to October 2, 1906; 122, Manitoba House, revised to September 29, 1906; 123, Fort Alexander, revised to September 21, 1906; 166, Sounding Creek, revised to October 15, 1906; 170, Yorkton, revised to October 30, 1906. Ottawa: Department of the Interior, Topographical Surveys Branch, 1906. *Presented by the Department of the Interior, Ottawa.*

Canada. **Department of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets 1 N.W. and 1 N.E., Guelph, Ontario. Ottawa: Department of the Interior, 1906. *Presented by the Department of the Interior, Ottawa.*

GENERAL.

German Colonies. **Sprigade and Moisel.**

Grosser Deutschen Kolonialatlas. Bearbeitet von Paul Sprigade und Max Moisel Herausgegeben von der Kolonial-Abteilung des auswärtigen Amts. Lieferung 5. Sheets: 1, Erdkarte zur Uebersicht des deutschen Kolonialbesitzes; 2*b*, Togo

(südliches Blatt): 16, Usumbura, Deutsch-Ostafrika; 19, Udjidji, Deutsch-Ostafrika. Berlin: Dietrich Reimer (Ernst Vohsen), 1906. *Price* 4m. *each part. Presented by the Publisher.*

World. **Bartholomew.**

Atlas of the World's Commerce. A new series of maps, with descriptive text and diagrams, showing products, imports, exports, commercial conditions, and economic statistics of the countries of the world. Compiled from the latest official returns at the Edinburgh Geographical Institute, and edited by J. G. Bartholomew, F.R.G.S., F.R.S.E. Parts 16 and 17. London: George Newnes, Limited, [1906]. *Price* 6*d. each part. Presented by the Publisher.*

The maps contained in the above-mentioned parts are as follows:—Part 16: 29, Postal map of the World, 1907; 30–31, Map of the World, showing telegraphic communication; 32, Industrial map of the British Isles; 38–39, Industrial map of Central Europe; 40, Agricultural and industrial maps of India.—Part 17: 67, Map of the World, showing meat-exporting and importing countries; 13, Copper districts of the World. These parts also contain continuations of the Commercial Gazetteer.

World. **Harmsworth.**

Harmsworth Atlas and Gazetteer. 500 maps and diagrams, and 105,000 references. Parts 4 and 5. London: The Amalgamated Press, Limited, 1906. *Price* 7*d. each part.*

These parts contain the following maps: Part 4. Nos. 31–32, The Scottish Lowlands; 61–62, The Alps (physical); 113–114, Indian Empire, industries and communications. Part 5. Nos. 15–16, Europe, industries and communications; 185–186, South America, general map; 195–196, Pacific ocean, cables and ocean depths.

World. **Johnston.**

The M.P. Atlas. A collection of maps showing the commercial and political interests of the British Isles and Empire throughout the World. Edinburgh and London: W. & A. K. Johnston, 1907 [1906]. *Price* 25*s. Presented by the Publisher.*

This atlas consists of forty-one plates, which contain altogether fifty-three maps. These consist of a selection of the general maps of continents, and those which are supposed to have special reference to the British Empire, from the publishers' well-known Royal Atlas, supplemented by a number of physical and commercial maps and charts, many of which have been specially drawn for this atlas. The Royal Atlas maps can generally be easily distinguished from the others by the greater fineness of the execution of their outline and lettering. Throughout the atlas the maps vary much in merit, and in some cases, such as Northern India and Abyssinia, which are taken from the Royal Atlas, although attempts have been made at revision, the general physical features in parts are so much out of date that it is to be hoped that in another edition entirely new maps may be substituted. As regards the physical maps, while some are certainly rough productions, one or two, such as the Bathy-orographical and Rainfall maps of the British Isles, are most creditable specimens, being clearly drawn and carefully printed in colours. Many of the maps would have been improved in appearance if less colour had been used; this is specially the case where inland waters, boundary-lines, and territorial divisions are concerned. No index to place-names is given, which greatly detracts from the value of the atlas for purposes of reference.

World. **Stieler.**

Neunten, von Grund aus neubearbeiteten und neugestochenen Auflage von Stielers Hand-Atlas, 100 Karten auf 200 Seiten mit 162 Nebenkarten in Kupferstich und einem alphabetischen Verzeichnis aller im Atlas verkommenden Namen (ungefähr 240,000 Namen enthaltend) herausgegeben von Justus Perthes' Geographischer Anstalt in Gotha. Lieferungen 31–34. Gotha: Justus Perthes, 1906. *Price* 6 *pf. each part.*

Parts xxxi. and xxxii. (in one) contain the following maps: 28, France, 1: 1,500,000, sheet 2; 51, Balkan peninsula, 1: 1,500,000, sheet 1; 60, Arabia, 1: 7,500,000; 89, United States, 1: 3,700,000, sheet 4. Parts xxxiii. and xxxiv. (in one): 20, Austria-Hungary, 1: 1,500,000, sheet 4; 48, Russia, 1: 3,700,000, sheet 5; Australia, 1: 5,000,000, sheet 2. Contains a continuation of the alphabetical index to place-names. Little has been done in the way of revision of these sheets, and they are much as they appeared when last issued. All the maps in these parts are dated 1907, but this is hardly correct, since they were published towards the end of last year.

World. **St. Martin and Schrader.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents, avec un texte analytique. Ouvrage commencé par M. Vivien

de Saint-Martin et continué par Fr. Schrader. Sheet 77, États-Unis (Région du nord-est). Paris: Hachette et Cie., 1906. *Price 2 fr. each sheet.*

World. **Woeikow.**

Verteilung der Bevölkerung auf der Erde. Von A. Woeikow. *Petermanns Mitteilungen*, Jahrgang 1906, Tafeln 17–20. Gotha: Justus Perthes, 1906. *Presented by the Publishers.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during November, 1906. *Presented by the Hydrographer, Admiralty.*

New Charts.

No.	Inches.	
3613		The World:—Mean lines of equal vertical force, 1907. 1*s.*
3564 m	= 6·9	Scotland, west coast:—Loch Kishorn and the approaches to Loch Carron. 3*s.*
1448 m	= 2·0 / 3·9	Spain, south coast:—Acebuche point to Chullera point, including Gibraltar bay. Plan:—Algeciras roads. 3*s.*
3609 m	= 6·3	Sardinia, north-east coast:—Port Terranova. 2*s.*
3583 m	= 2·9	Newfoundland:—Bay of Exploits, sheet 5. 3*s.*
3610 m	= 3·6	Magellan strait:—Willes, Harriss, and Fox bays. 2*s.*
3611 m	= 2·8	Plans on the south coast of Sumatra:—Zutphen islands, Kiluang bay. 2*s.*
992 m	= 1·7	Japan:—Akkeshi wan. 2*s.*
3602 m	= 5·9 / 4·0	Anchorages in Yezo island:—Mombetsu anchorage, Mori roads. 2*s.*

New Plans and Plans added.

98 m	= 1·35	Plans on the south coast of Cuba. Plan added:—Puerto Francés. 2*s.*
1364 m	= 0·99	Africa, west coast:—Cape Mesurado to Baffu bay. New plan:—Junk bay. 3*s.*
71 m	= 2·5	Bay of Bengal:—Madras to Calimere point. New plan:—Pondicherri anchorage. 4*s.*
1495 m	= 4·4 / 5·9 / 5·0	Japan:—Aburatani bay to Ando zaki. Plans added:—Shichirui ura, Yunotsu ura, Yesaki ko. 3*s.*
2198 m	= 2·9 / 3·0	Harbours and anchorages on the north coast of Nipon. Plans added:—Yezumi ura, Sagi ura. 2*s.*
3003 m	= 1·75 / 2·95 / 6·0 / 1·92 / 1·75	Japan:—Ando zaki to Otose zaki, including Sado island. New plans:—Niigata ko, Ogi ko. Plans added:—Tsukumo wan, Yebisu ko, Naoyetsu ko. 3*s.*
3131 m	= 10·0	Anchorages in New Hebrides islands. Plan added:—Narovorovo.

Charts Cancelled.

No.	Cancelled by	No.
1448 Spain, south coast:—Gibraltar bay, Algeciras roads.	New chart. Acebuche point to Chullera point, including Gibraltar bay. Plan:—Algeciras roads	1448
2056 Sunda strait and approaches:—Plan of Kiluang harbour on this sheet.	New plan. Kiluang bay on chart	3611
993 anchorages in Yezo island:—Plan of Mori roads on this sheet.	New plan. Mori roads on chart	3602
992 Japan:—Akishi bay.	New plan. Akkeshi wan	992

Charts that have received Important Corrections.

No. 2390, Scotland, west coast:—East and west lochs Roag. 2729, Ireland, west coast:—Sligo and Ballysadare harbours. 2210, Black sea:—Plans in. 3206, Antarctic ocean (Sheet 8). 566, Iceland, eastern portion. 2980, Iceland:—Storksnaes to Portland. 2343, San Domingo:—Samana bay. 1982*b*, South America, east coast:—River Paraná (Sheet 2). 516, Mexico, south-west coast:—Mangrove bluff to Cape Corrientes. 3313, Alaska:—Yakutat bay. 654, Alaska:—Bering strait. 1363, Africa, west coast:—Sherbro island to Cape Mesurado. 833, Bay of Bengal:—Rangoon river and approaches. 1180, China, east coast:—Approaches to Hong Kong. 1466, China, east coast:—Hong Kong, Fotaumun pass. 2412, Japan:—Amoy to Nagasaki. 2924, Australia, east coast:—Cape Grafton to Hope islands.

(*J. D. Potter, Agent.*)

Indian Ocean. **Meteorological Office.**

Monthly meteorological Chart of the Indian Ocean north of 15° S. lat. and Red Sea for January, 1907. London: Meteorological Office, 1906. *Price* 6*d. Presented by the Meteorological Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Monthly meteorological Chart of the North Atlantic and Mediterranean for January, 1907. London: Meteorological Office, 1906. *Price* 6*d. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for December, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for January, 1907. Washington: U.S. Hydrographic Office, 1907. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Kashmir. **Ritchie.**

Forty-three photographs of Kashmir, taken by Captain E. MacI. Ritchie, R.H.A. *Presented by Captain E. MacI. Richtie, R.H.A.*

A series of quarter-plate photographs taken during a sporting expedition in the spring of last year. The following are the titles:—

(1–3) Views in the Sind valley; (4) Crossing the Zogi La; (5) The approach to Leh; (6) Irrigating fields in Ladak; (7) Cemetery near Leh; (8) Ladaki with pony; (9 and 10) Agriculture in Ladak; (11 and 12) Chortens; (13) Main bazaar, Leh; (14) Ibex ground, Nang nullah; (15) Ibex and Kashmiri Shikari; (16 and 17) Women of Nang; (18) A nomad inhabitant of Kharnak; (19) Pack-yaks; (20) *Ovis ammon;* (21) Ladaki and Kashmiri with a burhel; (22) Kashmiri and Ladaki with *Ovis ammon;* (23) Two inhabitants of Gya; (24) Early morning in the Kurtsephu nullah; (25) A red bear; (26) Rock dwellings in the Wakkarung nullah; (27–30) Repairing a bridge in the Shigar valley; (31) Pack-yaks waiting to be unloaded; (32) Pack-yaks in a snowdrift; (33 and 34) Snow-bridges; (35) Crossing a "rope" bridge in the Shigar valley; (36) A bad bit of road, Shigar valley; (37) Crossing a pass near Dras; (38) View near Baltal; (39) Near Senamarg; (40) In the Sind valley; (41) Manasbal lake; (42 and 43) On the Dal lake.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Vierte Reihe, Heft 6. Algenvegetationsbilder von der Küsten der Färöer. Von Dr. F. Börgesen. Jena: Gustav Fischer, 1906. *Price* 2.50*m.*

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

Albert Nyanza 1337
Scale 1:10,000,000 or 1 inch
Railway
Route
Elgon 14152
Ruwenzori 16815
Entebbe
Pt Florence
Saltima 13214
Kenya 17007
L. Albert Edward 3054
L. Nakuru 5468
L. Naivasha 6135
Kinangop
Victoria Nyanza 3720
Kagera R.
Mfumbiro
Nairobi
L. Kivu 4822
L. Magadi 2050
L. Natron 1936
Kilimanjaro 19321
Lake Tanganyika 2632
Mombasa
CONGO FREE STATE
PROTECTORATE
UGANDA
BRITISH
EAST AFRICA
GERMAN
EAST
AFRICA
Mt EMIN
Mt SPEKE
STANLEY
Mt BAKER
Mt LUIGI DI SAVOIA
Umberta Pk 15607
Stuhlmann Gl.
Speke Gl.
Johnston Gl.
Margherita Gl.
Queen Alexandra Gl.
Grauer Pk
King Edward Pk
Scott Elliot Pass
Camp 13271
Camp 13324
Camp 13668
Camp 14462
Camp 14682
Camp 12304
Camp 12385
Camp 12887
Camp 13257
Camp 13261
Camp 13662
Camp 13662
Camp 13662

THE PEAKS, PASSES & GLACIERS OF RUWENZORI.

to illustrate the paper by

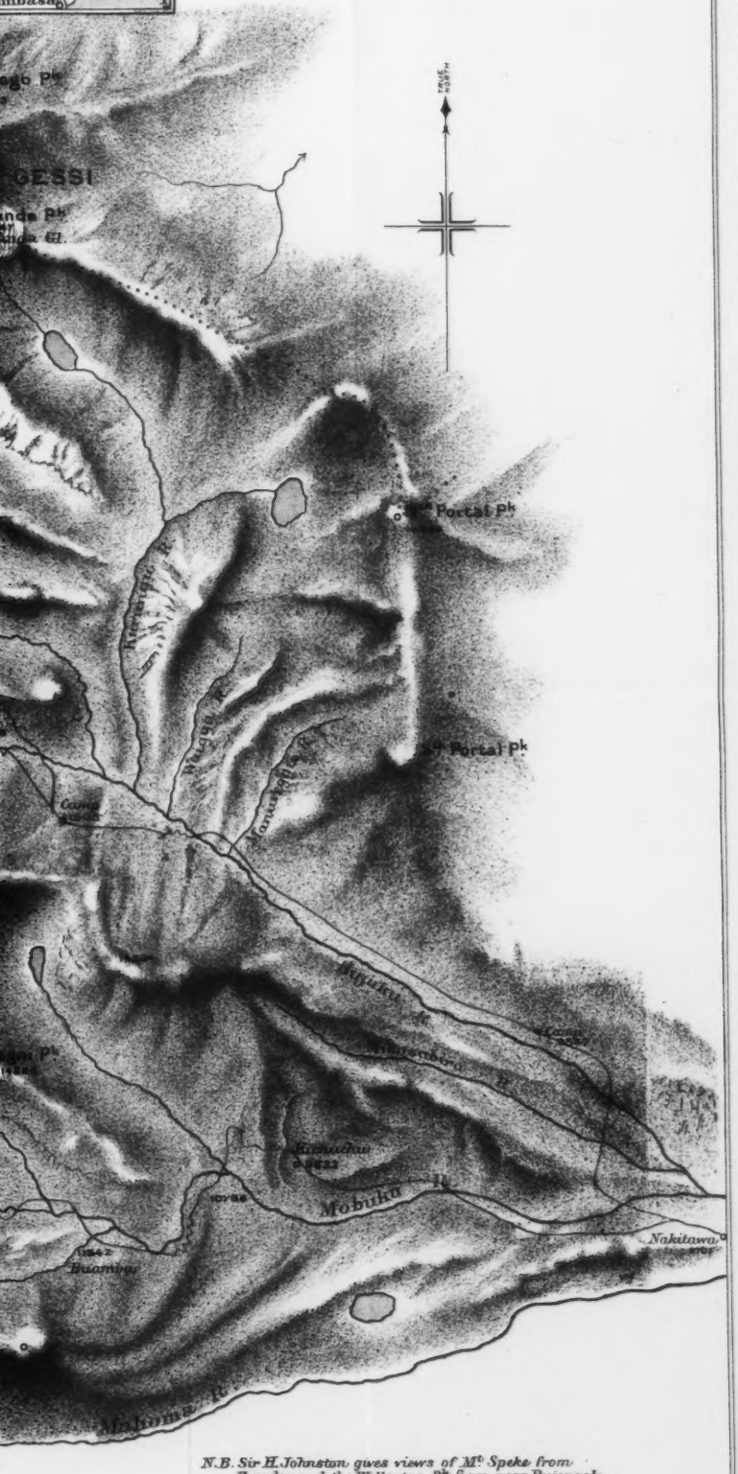
H.R.H. THE DUKE OF THE ABRUZZI.

Scale 1:50,000 or 1·27 inches = 1 mile.

0 ½ 1 2

Heights in Feet. *Route* ——

Watershed .....



N.B. Sir H. Johnston gives views of Mt. Speke from Ibanda, and the Wollaston Pk from near Buyongolo both under the name of Duwoni, in his book "The Uganda Protectorate."

INDIAN OCEAN

THE CENTRAL ISLANDS of the SEYCHELLES GROUP

to illustrate a paper by

J. STANLEY GARDINER, M.A.

Scale, 1:250,000 or 1 Inch = 3·94 Stat. Miles.

0 5 10

Reference

The soundings are expressed in fathoms.
The 3 fathom line is shown thus .....
" 5 " " " " " .....
" 10 " " " " " .....
" 20 " " " " " .....
Where no symbol in black is shown for the fathom line the depths are approximate only
The following abbreviations show the quality of bottom.
br. brown, brk. broken, cl. clay, crl. coral, f. fine
gl. globigerina, h. hard, m. mud, oz. ooze,
r. rock, s. sand, sft. soft, sh. shells, w. white.
Heights in feet.

Depths in fathoms.

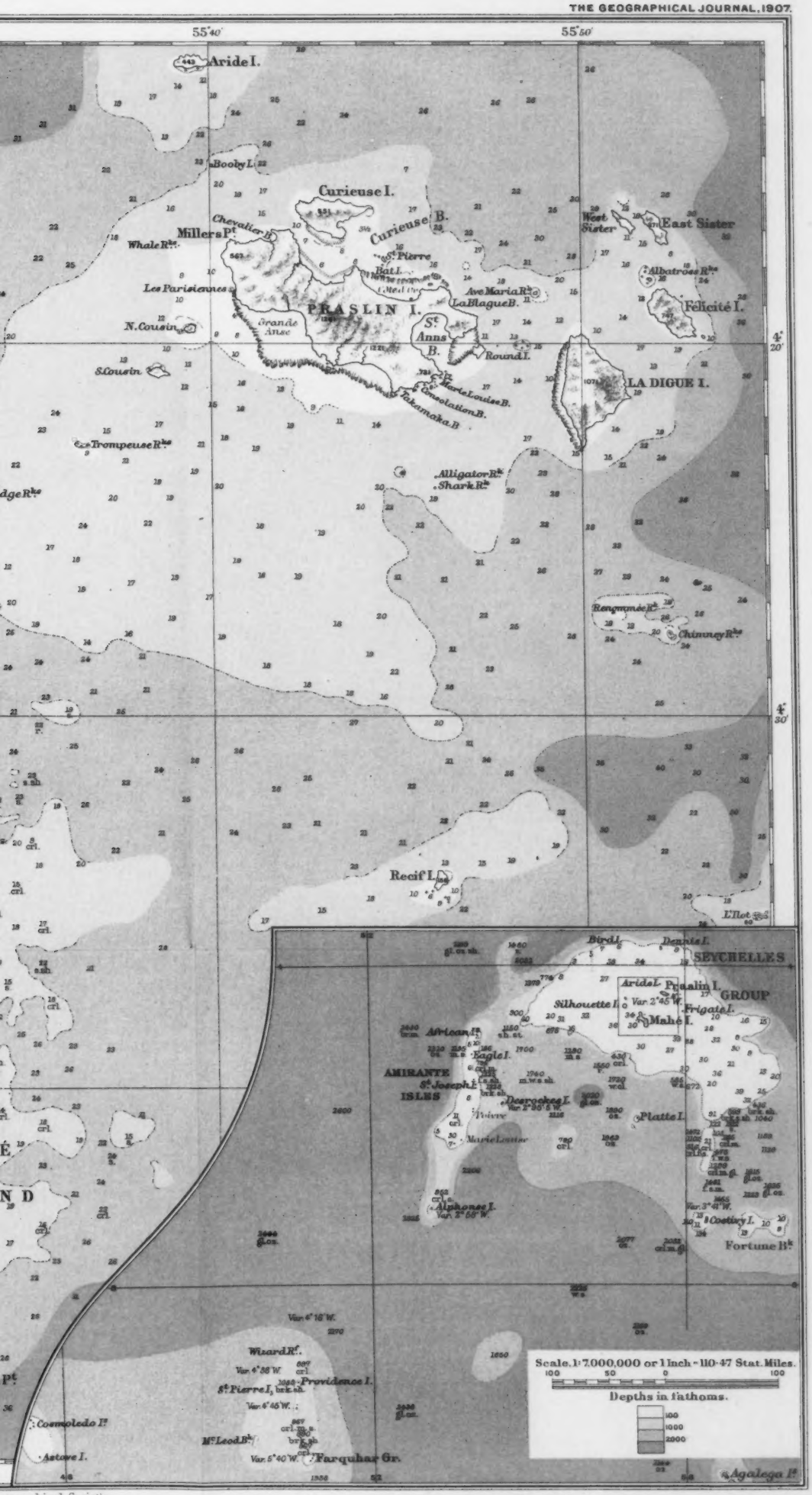
10
20
30

55°20' 55°30'

4°20' 4°30' 4°40'

North I.
SILHOUETTE I.
Anse Mondon
Anse Lascar
Grande Barbe
Trevor Pt.
Mon Plaisir
Castle Pt.
L.d Passe
Gladdon Pt.
Madge R.
Mamelle I.
Brisbane R.
North I.
North West Pt.
Requin Bk.
Mt. Howard
North West Bay
Port Victoria
St. Anne I.
Anse Gaulette
Anse Boileau
Port Launay
C. Ternay
Mt. Simpson
Trois Frères
Mahé
Anse Gaulette
Beacon I.
Mayenne I.
Long I.
Harrison Rk.
Cerf I.
Cerf Passage
Ternué Passage
Conception I.
Thérèse I.
Port Glaud
Vache I.
Mt. Harrison
Mt. Sebert
S.E. Island
Pte. La Rue
Anse aux Pins
MAHÉ ISLAND
Pilot Patches
Boileau Bay
Anse Boileau
Stork Patch
Anse La Mouche
Chauve Souris
Anse Soleil
Anse Petite
Sel Pt.
Souris I.
Royal B.
Mt. Lockyer
Pte. Lazare
Poules Bleu
Anse Takamaka
Anse Intendance
Anse Forbans
Mascarin Rk.
Anse Bazarca
Police Pt.
Police R.
Capucin Pt.
Capucin Rk.

Published by the Royal Geograp



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